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ESSEX COUNTY COUNCIL PRIMARY SCHOOLS (1973-1993)

A DESIGN APPRAISAL

VOLUME ONE

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A thesis submitted in partial fulfilment of the
requirements of the University of Greenwich
for the Degree of Doctor of Philosophy.

This research programme was carried out
in collaboration with the Essex County Council
Property Services Department.



August 1996

ABSTRACT

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DEGREE OF DOCTOR OF PHILOSOPHY.
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A DESIGN APPRAISAL.**

The thesis is an appraisal of various design aspects of new and extended primary schools in Essex built between 1973 and 1993.

The investigation method included a review of primary school design literature and County Council archives, interviews with Officers concerned with the design and operation of primary schools, visits to schools, analysis of user comment by questionnaire, and investigative essays.

The appraisal contains three parts:- part one a review of primary education since 1973; part two strategic aspects of primary school design, including, planning, constructional systems, aesthetics, environmental design, engineering services, interior and exterior design; part three detailed requirements of today's primary school room by room; plus conclusions promulgating lessons for the future.

Main conclusions of the study are :-

- Economic and political pressures have reduced quality and space standards, encouraged traditional teaching methods, and reduced community use.
- The County Architect and Education department's influence diminished as power was delegated to individual schools.
- Limited generic plans, including the paired classbase, have developed which are a useful precedent for future design teams.
- System building produced stereotype deep plan buildings, with austere architecture which failed to respect their setting or delight users. Current traditional pitched roof designs are more successful, but relatively uninspired.
- Despite environmental design and engineering attempting to balance conflicting factors and reduce energy consumption by using alternative fuels and solar passive methods, users prefer locally controlled traditional heating and ventilation systems.
- Interiors are high quality with a domestic ambience, whereas exteriors are poor quality with windswept wastelands without enclosure or facilities for outside teaching.
- Users believe 1980s schools are too small, sufficient classbase space is a priority, and demand better quality exteriors.

This thesis should provide a clear view of the clients' requirements, past precedent, and critical relationships and will help future multi-disciplinary design teams, working under difficult conditions, produce better primary schools for Essex.

ACKNOWLEDGEMENTS.

Like the design of a primary school, the completion of this thesis has been very much a team effort and I have relied heavily on information, advice and support from many designers, teaching staff, educationalists, academics, colleagues, and friends including:-

- Past and present members of the County Council's Property Services and Education Departments who were able to provide expert comment and information on 25 years of primary school design.
- The staff of the primary schools visited who gave generously of their time despite the pressures of running a busy education establishment.
- Alan Willis, Director of Property Services, and Barrie Page, Design Policy Manager, from the Property Services Department for providing access to the departments archives and their support, encouragement and understanding when the pressures of a full professional life occasionally clashed with the academic needs of this thesis.
- The primary school model brief team, with special thanks to John Wibberley and Paul Critchley for use of the basic data on detailed accommodation requirements.
- Juliet Austin, the Property Services Department Librarian who has been able to find printed material from the most obscure sources and arrange loans for substantial periods.
- Lucy Thompson and Shirley Dunn from the Property Services secretarial staff for their assistance in entering large quantities of text onto the word processor, which compensated for my limited keyboard skills.
- My two supervisors. Professor Anthony Quiney and Geoffrey Hacker from the University of Greenwich. for their encouragement and advice on the academic form and content of the thesis.

I would particularly like to thank my wife Shirley for proof reading the text several times, and her support and understanding over a considerable period of time as this research project inevitably intruded into her social life just as much as mine.

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CHAPTER 1

INTRODUCTION

1.1 FINAL REPORT OF RESEARCH PROJECT

This thesis is the final report of a Phd research project into the design of primary schools in the County of Essex constructed during the period 1973-1993. The project was carried out at the University of Greenwich School of Architecture and Landscape, and sponsored by Essex County Council Property Services Department.

The research project revealed a large body of expertise about the design of primary schools. This has been analysed and appraised in the hope that it will help the designers of future primary schools to build upon this knowledge base, to avoid the mistakes of the past, and repeat the successes.

1.2 THE RESEARCH PROCESS

The research project was carried out between February 1993 and December 1995 building on foundations laid by the Property Service Department Development Group which, under my direction, spent the previous two years producing a primary school brief in conjunction with the County Education Department.

The research process was executed in five stages:-

FIRST STAGE

The first stage involved a review of the literature on primary school design nationally and within the County of Essex, covering the study period. This included books on primary school design, magazine articles and publications from the Department for Education, County Council committee minutes, scheme and estimate brochures and notes of meetings, etc. (see Bibliography).

SECOND STAGE

The second stage involved interviewing various past members of staff from the County Council's Education and Architect's departments, as well as several national experts to discover more of the recent history of primary school design and their opinion of its relevance. This was followed by a series of interviews with specialists from within the Education and Property Services departments to cover the various facets of design. (see illustration D1)

NAME	OCCUPATION	SUBJECT	PERIOD	DATE OF INTERVIEW
BISHOP, NORMAN	ELECTRICAL ENGINEER	LIGHTING, POWER AND COMMUNICATIONS	1968 - 94	5 JANUARY 1994
BYATT, KEITH	MECHANICAL ENGINEER	HEATING AND VENTILATION	1960 - 94	28 MARCH 1994
GRAMMOND, MAURICE	ARCHITECT - ACA	HISTORICAL BACKGROUND	1947 - 77	14 DEC 1993
DAVIES, ROGER	LANDSCAPE OFFICER	EXTERNAL WORKS	1968 - 95	12 JUNE 1995
FRAME, IAN	ENVIRONMENTAL SCIENTIST	DAYLIGHT	1975 -94	3 FEBRUARY 1994
HODGES, PETER AND DOBSON, KEN	EDUCATION OFFICERS	HISTORICAL BACKGROUND	1989 - 94 1988 -94	26 APRIL 1984
HOLLAND, LEN	ARCHITECT - DCA	HISTORICAL BACKGROUND	1973 - 91	11 NOV 1993
HOWARTH, MILES	EDUCATION OFFICER	HISTORICAL BACKGROUND	1974 - 92	20 JANUARY 1994
KING, BRIAN	ENVIRONMENTAL ENGINEER	ENVIRONMENTAL DESIGN	1978 -85	7 FEBRUARY 1994
LAVENDER, RALPH	PRIMARY SCHOOL INSPECTOR	HISTORICAL BACKGROUND	1976 - 91	14 MARCH 1994
MEDD, DAVID	ARCHITECT	HISTORICAL BACKGROUND	1945 -87	17 JANUARY 1994
PAGE, BARRIE	ARCHITECT - DESIGN MANAGER	HISTORICAL BACKGROUND	1971 - 94	1 FEBRUARY 1994
PAGE, PETER	ARCHITECT	HISTORICAL BACKGROUND	1973 - 85	15 DECEMBER 1993
SENSIER, JOHN	FURNITURE BUYER COUNTY SUPPLIES	INTERIORS	1971 - 95	25 JUNE 1995
SHARPE, MIKE	CHIEF EDUCATION OFFICER	HISTORICAL BACKGROUND	1980 - 94	12 JANUARY 1994
WILLIS, ALAN	ARCHITECT - DIRECTOR PROPERTY SERVICES	HISTORICAL BACKGROUND	1976 -94	22 MARCH 1994

ILLUSTRATION D1 - LIST OF INTERVIEWS WITH PRIMARY SCHOOL DESIGN EXPERTS

THIRD STAGE

The third stage involved visits to 18 primary schools throughout Essex, of different sizes, locations and age to gather user comments and first hand experience of the actual buildings. Information was gathered on the design of the buildings including plans, costs and photographs and various staff groups were interviewed. (see illustration D2)

FOURTH STAGE

The users of the schools were also invited to complete a standard questionnaire covering various aspects of primary school design, with the opportunity to give a rating between "very good" and "very poor" This information was collated, analysed and used as the basis of comparative user opinion on the performance of various aspects of primary school design.

The ratings from the questionnaires had to be edited, however, as some schools were unable to complete those parts of the questionnaire which did not apply to them and the sample of some questions was too small to be valid. Those questions which elicited a response of less than 50% were omitted from the analysis, but those which had a good response with only one or two questions unanswered, were completed with a median rating so as to avoid any bias.

The scores were then converted to percentage ratings where "very poor" equaled 0% and "very good" equalled 100% to produce statistically understandable results which could then be compared with each other. (see illustration D3)

FINAL STAGE

The final stage was the writing of the thesis itself. This comprised a series of investigative essays covering Trends in Primary School Design, Open Plan Design, Construction Systems, Space and Quality Standards, Use of Short Life Structures, Environmental Design and Services, External Spaces, Internal Spaces, the Users Views, the Brief, and Extensions and Remodelling.

These essays analysed a number of problems and identified trends. They proved to be very useful in clarifying many issues and have been used to promulgate much of the applied knowledge within this design appraisal.

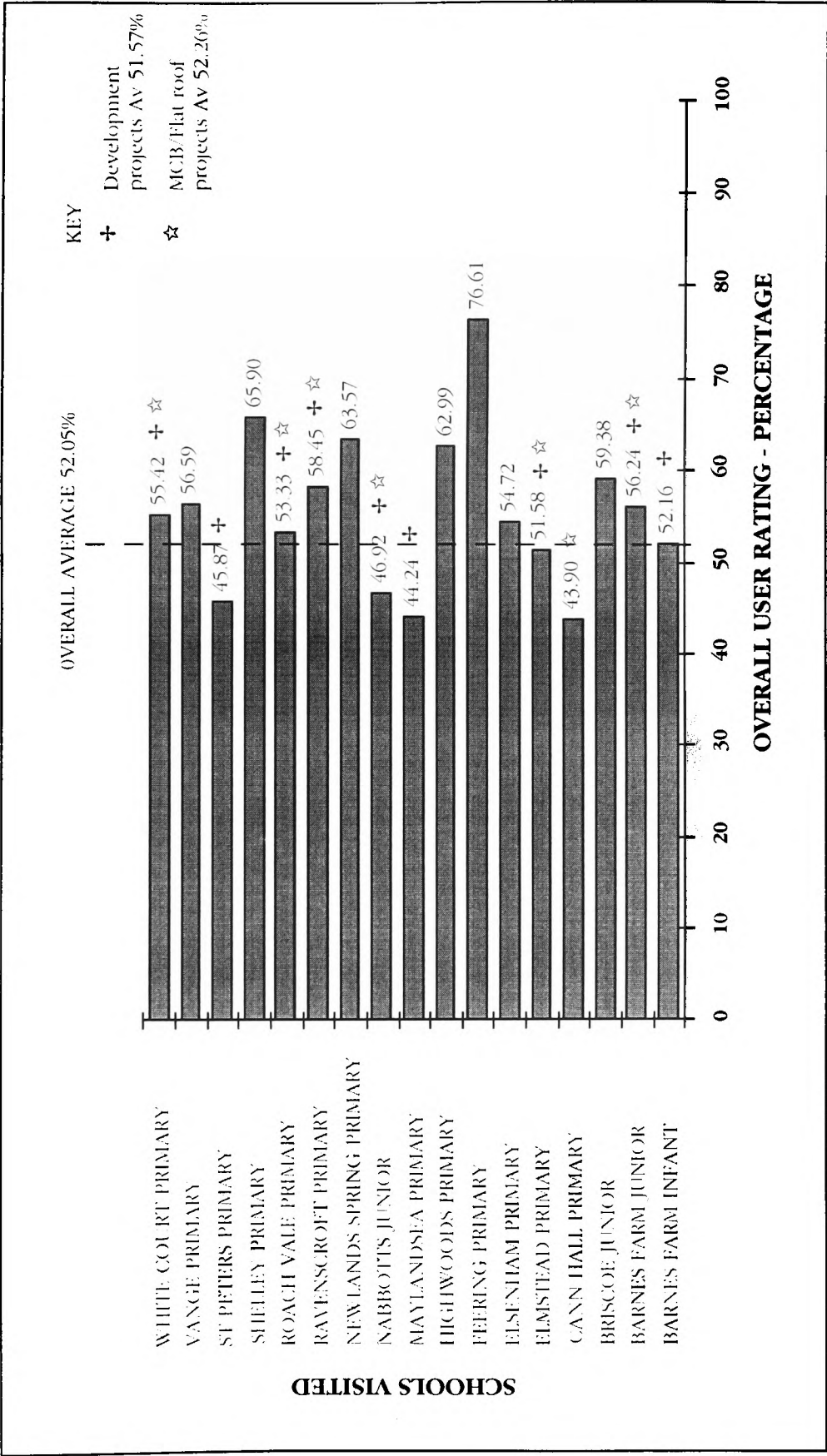


ILLUSTRATION D3 - OVERALL USER RATING OF INDIVIDUAL SCHOOLS

Based on the results of an analysis of questionnaire ratings (see French, C. P., 1995)

1.3 PERSONALITIES

I have tried to avoid reference to particular personalities within this thesis, wherever possible, partly to avoid embarrassment to them and partly to concentrate on design issues without too much distraction.

My task would have been impossible, however, without the co-operation of past members of the County Council's staff, current expert professionals within the County Council's Education and Property Services Departments, and the head teachers of the County's primary schools. The information and opinion they were able to impart gave me added insight into primary school design and a greater understanding of the part particular individuals with vision and enthusiasm played in shaping the design process over the past 25 years.

1.4 DESIGN APPRAISAL AND REFERENCE TOOL

This thesis is not intended to be a historical study, although it covers 20 years of recent history in some detail, as the reader needs to understand why the Essex primary school is currently as it is before contemplating how it should be in the future. It also records many of the developments within the County Architect's Department during this period which are in danger of being lost by current changes in Local Government structure and methods of procuring architectural services.

It will, however, attempt to present the knowledge accumulated about the design of Essex Primary Schools since 1973 in a format which can be used as a reference tool by all members of future design teams and not simply sit on a shelf unread.

I have tried to ensure that it is sufficiently comprehensive so that it can be used by the novice designer, covering all aspects of primary school design and establish the operational and technical brief for the building, its surroundings and servicing. It will also attempt to advise on various aspects of design which have been found to work well or have been less successful.

I hope that the format will also allow the experienced designer to avoid some of the more basic background information and go straight to specific detail, together with a quick checklist format useful to the designer under pressure of time. The design appraisal also acknowledges that the design of a primary school is a team effort and much of the data is presented in a holistic format

aimed at the whole design team including Education project officer, Architect, Building Surveyor, Quality Surveyor and Engineers, either working together as a multidisciplinary team on a large new build or extension project, or separately on a minor works remodelling or extension project.

Much of the study is based upon the various briefing documents produced by the Education and Architect's Departments since 1973, but this document goes much further by interpreting and modifying the brief using information gleaned during the research process so that it can be applied equally to new build, extension or remodelling projects, and incorporating the accumulated wisdom from 25 years experience of designing and building primary schools in Essex.

1.5 CONTENTS

The design study is divided into three main sections:-

The first sets the scene with a brief review of the primary education system over the last 25 years in Great Britain, and Essex, in particular plus the role played by different members of the design team.

The second examines the strategic aspects of designing an Essex primary school, including overall planning, constructional systems, aesthetics, environmental design and engineering services, interior design, and exterior design.

The final section analyses the detailed requirements of both internal and external primary school accommodation, room by room, incorporating information gleaned from interviews with experts, and extensive visits to existing schools in Essex.

The conclusions attempt to draw the major lessons learnt from the whole research project together into a short pithy narrative useful to the reader wishing to get to the core of the subject quickly without reading the whole document in detail.

CHAPTER 2

POST WAR PRIMARY SCHOOL EDUCATION IN GREAT BRITAIN AND ESSEX

2.2 INTRODUCTION

The development of primary school design in Essex since the Second World War has been fashioned by, and is a reflection of, national trends affecting the whole Education system throughout Great Britain.

Education has been greatly influenced by the liberal thinking which followed the war, with the introduction of progressive methods of teaching and this has affected school architecture. The last 10 years has, however, seen a reaction to liberal attitudes with a general desire to return to more traditional values and teaching methods.

This chapter will attempt to identify many of the national and local trends affecting primary school education since 1973 and their affect on schools in Essex.

2.3 POLITICAL PRESSURES

The British education system and its architecture has been subject to considerable political influence since 1945, as politicians at both national and local level have reacted to changing circumstances, the mood of electors, and economic pressures laced with a large measure of their own particular political dogma.

Post War Liberal thinking

The Second World War was a watershed in sociological and political thought amongst ordinary people. People in nearly every strand of society, whether they served at home or abroad in the armed services, on the land or in the factories producing food or munitions for the troops, were all exposed to freedoms never experienced before.

Working men whose social and working life had been restricted by the class structure of pre-war Britain travelled to foreign countries, experiencing new environments, different cultures and mixing with servicemen from all parts of the world and social class.

Some women also experienced the same freedoms of service life as their male colleagues, but the majority of women gained their freedom by working on the

land, in factories or the service industries, releasing them from their domestic bonds.

When the war was over, these people were unwilling to return to the class divisions or restrictions of the past and demanded a more even distribution of wealth and opportunity in return for the sacrifices they had made for King and Country, and also displayed a more liberal approach to the country's social institutions.

The Welfare state

The main physical manifestation of this demand for social change was the setting up of new social institutions such as the National Health Service, where treatment was provided for all on the basis of need rather than ability to pay, and the comprehensive school system which provided equal opportunity of education to all children irrespective of social background.

The welfare state grew in the post-war years of the 1950s and 1960s, with large programmes of school building to suit the rapidly growing school population, until huge sums of public expenditure were required to fund the massive social institutions created. Liberal thinking also grew until it permeated all strands of society with strong trade unions, medical treatment for all, irrespective of cost, and the introduction of progressive teaching methods into most schools.

Reaction to Liberal policies

The mid 1970s saw the start of a reaction to liberal thinking with a general questioning amongst ordinary people about the power of the trade unions, cost of the National Health Service, and effectiveness of progressive teaching methods.

This disaffection was orchestrated by the Conservative Party during the late 1970s, and they were returned to power in 1979 with Margaret Thatcher as their leader with a mandate to reform the welfare state.

Market forces

The Thatcher government was determined to make the state institutions more responsive to market forces and more accountable to their customers, which within the education service were thought to be the pupils' parents.

The government thought that parents should have a greater choice of which school their child attended, and much more information on the performance of their children and individual schools generally.

The emphasis on increasing parental choice has manifested itself recently by the publishing of league tables of performance, the introduction of grant maintained status and greater powers to individual schools and their governors.

Empowerment

The Conservative government has been nurturing an enterprise culture during the past 15 years aimed at removing layers of government bureaucracy, and empowering individuals and institutions to take control of their own destiny. They have introduced legislation to give schools greater control over their own future through the devolution of budgets to individual schools, greater management powers to headteachers and governors, and more information and choice to parents.

Parental choice

The introduction of parental choice through recent legislation means that families can now send their children to popular schools, often outside their catchment area, which has led to a situation where these schools have grown in size (mainly by the addition of relocatable classrooms), and the less popular have suffered, often being under capacity with small classes and limited resources.

The introduction of league tables and parental choice has also led to a greater awareness amongst primary schools of their image within the local community, with a corresponding increase of communication to parents via newsletters and brochures. The reception facilities in schools have also been dramatically improved to foster a caring image, with comfortable seats and ample displays of pupils' work.

The increase in parental choice and power to Governors has also increased the disaffection with progressive teaching methods and modern buildings, as most parents and governors treat open plan schools and progressive teaching with suspicion, often based on comparisons with their own experience of school with its traditional classroom based environment.

Local management of schools (LMS)

The Government introduced legislation in the 1988 Education Reform Act to force Local Authorities to devolve much of their centrally held budget to individual schools, allowing governors and headteachers to determine their own spending priorities, within certain limits, to suit their own perceived local needs. This arrangement is known as the locally managed scheme or LMS.

Grant maintained schools (GMS)

Central Government also introduced grant maintained status for all schools in 1992, which allowed any school controlled by a local authority to receive its' funding direct from the Government via a special funding agency and become independent of local authority control. Special arrangements were put in place which allowed individual headteachers and governors to ballot the pupils' parents before applying for GM status to the Secretary of State for Education. Many Essex secondary schools have taken advantage of the legislation and obtained GM status, but it has proved less popular amongst primary schools, with only 72 out of 579 obtaining GM status by June 1995. (see illustration D4)

Government policy on locally managed and grant maintained schools during the late 1980s and early 1990s has, however, put renewed pressure on scarce resources for building as local politicians attempt to respond to a decrease in their power over the primary education system.

Essex response to devolution

At first the Conservative controlled Essex County Council was happy to follow Central Government policy, and large parts of their budget were devolved to locally managed schools. This, however, had the affect of reducing the County Council's ability to husband resources to build and extend schools in different parts of the county.

AREA	COUNTY SCHOOLS	GMS SCHOOLS	TOTAL
NORTH WEST ESSEX	79	9	88
NORTH EAST ESSEX	90	13	103
WEST ESSEX	67	9	76
MID ESSEX	87	13	100
SOUTH WEST ESSEX	107	7	114
SOUTH EAST ESSEX	77	21	98
TOTAL	507	72	579

ILLUSTRATION D4 - NUMBER OF ESSEX PRIMARY SCHOOLS (June 1995)
Showing the number and distribution of schools which have opted for grant maintained status.

Based on the 1995 list of Essex schools.
 (See ECC Education Department, 1995b)

Those schools which wished to leave the control of the County Council and become grant maintained were encouraged to do so, but they took a disproportionate part of the County Council's budget with them, thus reducing the authority's resources even further.

Ironically, these same schools which had been starved of resources for years were given large grants towards the cost of building works by central government as soon as they achieved grant maintained status, and some commentators have accused the present government of using their capital resources to bribe schools contemplating GM status.

Many of the new Liberal and Socialist controlled County Councils elected during the last Local Government elections of 1992 have, however, been attempting to halt the flow of schools opting for grant maintained status. They have also used their capital resources to influence individual schools, partly by improving the quality of their built environment, partly by increasing the number of new school places in permanent accommodation, and partly by rectifying multiple deficiencies in older schools.

Back to Basics

The most recent government political initiative, "Back to Basics", also typifies the wish of the present government to return to almost Victorian principles of the 3 R's, family life, etc.. This has reinforced the position of the class teacher as the disciplinarian figure at the front of the class, which is at odds with many of the child-centred progressive teaching methods prevalent in today's primary school.

Attack on Local Government

The present Conservative government has also been pursuing a policy of reducing the power and influence of local authorities generally, and in the field of education in particular. Presumably it sees the local authorities (many of a different political persuasion) as a threat to the success of its reforms, and has progressively removed their influence by transferring the funding of large sections of the education service to non-elected funding councils or quangos financed direct by the government.

The war on extravagant design

The County Council has been controlled, during the greater part of the past 25 years, by a Conservative majority and has responded to national pressures on public expenditure by attempting to reduce capital budgets generally, which has impacted on space and quality levels of new and extended primary schools.

Like most politicians, however, they also realised that it was important to their chances of re-election that they should appear to be building more schools and improving existing ones, and they were very keen that planned projects should continue. The effect of a very full programme of projects and a capped or reduced budget was to squeeze quantity and quality standards even more.

This desire to maintain the building programme was reinforced at a local level by members who felt they could be attacked by political opponents over the poor condition of buildings and wished to be seen to support their local school and its property needs.

They were, however, also impressed by the need for economy, and embarked from time to time on a crusade to eradicate, what they considered to be, waste and extravagant design, criticising design teams for providing such things as spot lights, metal clad light switches and hardwood joinery. Unfortunately, this purge rather got out of hand and I can remember one particularly apt quotation heard at a project crit in the early 1980s, when the Deputy County Architect was heard to say, "I don't care how much it costs as long as it looks cheap" (French, C.P., 1994a)

2.3 ECONOMIC

The economic climate in Great Britain since the war has suffered from huge swings of fortune from the post-war austerity of the 1950s, through the "never had it so good" 1960s, to the recent decline in manufacturing base and recession. Inevitably these economic swings have affected Central and Local Governments resources for the construction of new and the up keep of existing schools.

Inflation

One of the greatest problems to beset Great Britain during the past twenty five years is inflation, and the effect that consequential Central Government anti-inflationary measures have had on public expenditure.

A study of inflation over the last 25 years (see illustration D5) shows that the average annual rate of inflation when expressed at a common base, rose continuously from 1971 to 1991, but at an increasing rate from 1979 to 1982 and from 1987 to 1991. Each rise in inflation has been followed by swingeing cuts in public expenditure, leading to a stop-go programme of school building, when planned programmes of work were often delayed or reduced in size.

Inflation has also created great difficulty in planning larger projects, which often had 5 year design and construction cycles, when increased costs were extremely difficult to estimate at out-turn, leading to last minute cuts in levels of specification on particular projects to bring them back onto budget.

The effect of rampant inflation within the building industry in the late 1970s and 1980s and restrictions on central and local government expenditure, also put pressure on designers to find ways of decreasing the size of schools by reducing circulation space further and providing the minimum teaching space. This culminated in a series of plans in the late 1970s and early 1980s which had unacceptably low floor areas, with little manoeuvrability to cope with increased numbers of pupils or changes in teaching practice and the curriculum. Fortunately this was recognised by educationalists, architects and politicians in the late 1980s, and the trend was reversed with space standards progressively increased over the past 10 years.

Capital payments

The effect of inflation was also very damaging to the County Council's ability to budget. Projects in the 1970s and early 1980s were traditionally allocated to a financial year and, provided they were started within the year, the County Treasurer attempted to contain the consequential payments to contractors and consultants from within the appropriate budget.

Uncertainties over inflation, reductions in the County Council's balances, and reducing Government grants forced the County Treasurer to abandon the "Starts programme" in 1985, and a Capital Payment system was introduced where the

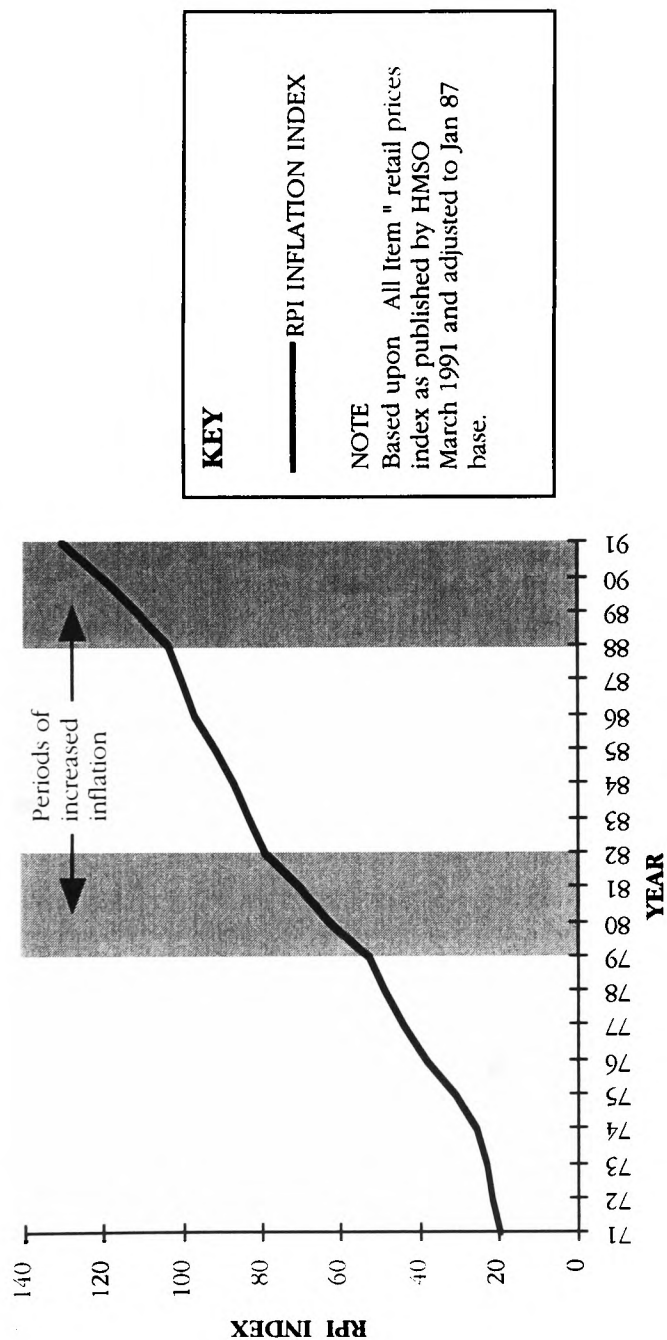


ILLUSTRATION D5 - ANNUAL (JANUARY) RPI INFLATION INDEX 1971- 1991
Showing the periods of increased inflation followed by swinging cuts in public expenditure

Based on Retail Prices Index
(See HMSO, 1991)

Education Department had to organise their programmes within strict cash limited payments profiles throughout the year. This has led to constant juggling of the programmes for building projects, their levels of specification and space standards, to give an even cash flow.

Boom and bust economy

The British economy has been affected by a number of economic crises since the Second World War, including the Suez Crisis in the 1950s, the 1967 devaluation crisis, the oil crisis in the early 1970s, privatisation of the public sector in the early 1980s, and the most recent recession which started in 1986. This has produced a boom and bust cycle of economic activity, with peaks and troughs showing themselves within the construction industry between 5 and 10 years apart. (see illustration D6)

This variable economic cycle has skewed normal inflationary pressures by accentuating price rises through a shortage of materials and labour, as the construction industry heated up due to a surfeit of work, and then prices stabilised or fell as the industry cooled off with a fall in orders.

This produced a climate of uncertainty within the industry making forecasting future price rises very difficult. It also had the effect of introducing an element of panic amongst clients, who pressurised designers to reduce space and quality standards to allow for an unknown inflation factor, and contractors, who inflated prices to allow for the unknown. The most recent period of deflation has, however, unusually allowed Local Authorities to build larger schools of better quality, while contractors have been working with non-existent profit margins often leading to insolvency, although this is a temporary phenomenon which is already dissipating.

Control of public expenditure

Central governments of all political persuasions since the Second World War have attempted to control the economy of Great Britain through a tight fiscal policy. They believed that, as the largest spending body in the country, their expenditure and resultant borrowing requirement had a direct impact on the economy and needed to be closely controlled. The present Conservative government also believes that public expenditure has traditionally been too

This chart illustrates the economic cycle within the building industry during the last 25 years with increasing numbers of new commissions peaking in 1973, 1978 and 1989, being followed by a rise in new orders and subsequent falls in commissions, leading to decreasing orders creating an erratic "boom and bust" output cycle .

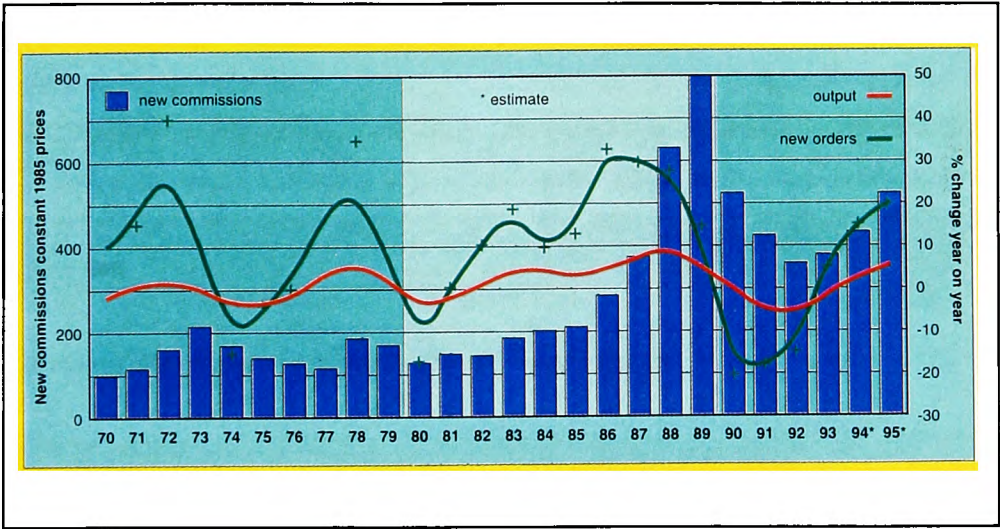


ILLUSTRATION D6 - THE BOOM AND BUST CYCLE

Reproduced from RIBA Journal
(See RIBAJ, 1994)
Original in colour

high a proportion of Gross National Product (GNP), and has been attempting to reduce it in real terms over the last 15 years.

Government controls

Essex County Council has always been constrained in its capital expenditure plans for primary schools. From the post-war years to the early 1980s, this was done by the Department of Education and Science approving individual schemes for loan approval, with a financial limit on the total annual expenditure.

This system was replaced in the mid 1980s by an annual block allocation to local Education Authorities for loan sanction, giving them greater flexibility over the number and cost of projects and the opportunity to inject funds from their own budgets, but the overall level of expenditure is still strictly controlled to fit the government's fiscal policy aimed at reducing overall public borrowing and debt.

Unfortunately, the amount central government has been prepared to loan the County Council to cover building costs has been based on basic need, i.e. the number of new school places required to cope with the demographic growth in school population, and takes very little account of the condition of existing schools.

Conflicting demands on the Capital Programme

Essex County Council has been faced with an increasing need to spend large sums on its schools over the past 10 years to cover:-

- The growth in primary school pupil numbers (see illustration D20) which are expected to grow from 94,300 in 1986 to 108,100 by the year 2001.
- Replacement of failing timber framed and HORSA concrete framed structures, which have reached the end of their life.
- Replacement of 622 temporary relocatable or de-mountable classrooms at primary schools provided to cope with rising pupil numbers.

The ability of the County Council to fund these much needed extensions, and upgrading and remodelling of its existing primary schools, depends on the level of capital funds available each year. It has attempted to supplement Central Government loan sanction by topping up the capital programme using receipts from the sale of surplus land and property. Unfortunately, the Government have placed restrictions on the use of such funds, which have also been badly affected by the depressed state of the property market. (see illustration D7)

Backlog of work

The County Council's failure to fund vital improvements due to Central Government restrictions has unfortunately had a domino effect on the capital programme, as non-funded schemes are delayed from year to year and a backlog has built up which rarely diminishes. (see illustration D8)

It is also ironic that the Department of Education regards the provision of temporary relocatable classrooms as basic need, and they have refused to pay for their replacement on the basis that they funded them when they were originally provided, often 15/20 years ago. This is a self-defeating argument to which there appears to be no solution at present.

The backlog of minor improvements and remodelling of primary schools has encouraged individual schools to save up any surpluses they may have from their own budget, which they now control under the LMS scheme, and spend them on construction works. These projects are typically under £10,000 in size, and include the conversion of cloakrooms to libraries, enlarging and refitting reception areas, enlarging administration offices, and removing partitions to give greater flexibility in teaching areas, as well as a variety of upgrading work including redecorations, new floor finishes and refitting toilet areas, etc.

The County Council and schools generally, have clearly been frustrated by the lack of resources over many years and their inability to tackle the backlog of improvements to existing schools. This has led to the development of an underclass of existing schools, with poor accommodation, compared to new schools. The present County Council is now tackling this problem in a systematic manner, however, and this should give some relief to many of the



ILLUSTRATION D7 - ESSEX SCHOOL BUILDING PROGRAMME 1990-1994

Showing the amount of money needed to keep pace with demand (bid) and actual Government loan sanction (allocation) including the County Councils contribution (top up).

Based on ECC Education Department spending plans (See ECC Ed Dept, 1990 and 1994)

School	a	b	c	d	e	f	g	h	i	j
Brentwood Crescent Road County Infants		x	x	x	x		x	x		
Brentwood Junction Road County Junior		x	x		x	x		x		x
Broomfield County Primary	x		x		x	x		x		
Canewdon Endowed Primary	x		x	x		x		x		
Finchingfield C.E. (Controlled) Primary		x	x				x	x	x	x
Gt. Bromley St George's C.E. (Con) Primary.	x	x		x	x			x	x	
Gt. Maplestead C.E. (Controlled) Primary	x	x		x	x			x	x	
Gt. Sampford County Primary	x	x			x	x	x	x		
Hatfield Heath County Primary	x	x	x				x	x		
High Beech C.E. (Controlled) Primary		x	x	x			x	x	x	x
Langham County Primary	x	x	x		x	x	x	x	x	
Little Oakley C.E. Primary	x	x	x		x		x	x	x	
Leigh on Sea West Leigh County Junior			x	x				x	x	x
Leigh on Sea West Leigh County Infants		x	x						x	
Manuden County Primary		x	x				x	x	x	
Margaretting C.E. (Controlled) Primary		x	x		x	x	x	x	x	x
Rayleigh County Junior			x			x		x	x	x
Rayleigh County Infants		x	x			x		x	x	
Rivenhall C.E. (Controlled) Primary	x	x			x	x	x	x		
Southend Porters Grange County Junior		x	x			x		x		x
Southend Porters Grange County Infants			x	x		x		x		
Stapleford Abbots County Primary	x	x			x	x	x	x	x	
Tiptree, Heath County Primary	x		x	x	x	x		x		
Tiptree, St. Luke's C.E. (Controlled) Primary	x	x		x	x	x		x	x	
West Mersea County Primary	x					x		x		
White Notley C.E. (Controlled) Primary	x	x	x		x			x	x	
Wimbish County Primary	x	x	x		x			x	x	x
Witham, Chipping Hill County Infants	x	x	x	x		x		x	x	

The tables show an analysis of multiple deficiencies at 28 Primary Schools most in need of a building project. The deficiencies are coded as follows:-

- a. More than 25% of classrooms in temporary accommodation.
- b. Lack of adequate hall on site.
- c. Under sized classrooms.
- d. Lack of running water in classrooms.
- e. Lack of amenity room.
- f. Outside toilets or toilets needing refurbishment or insufficient toilets.
- g. Lack of an adequate room for the Headteacher.
- h. Lack of adequate clerical and medical inspection facilities and staffroom.
- i. Lack of adequate hard play area.
- j. No adequate playing field within easy reach.

The analysis does not take account of other issues, such as the general environment around the school, the relative quality of the buildings themselves, numbers on roll etc. which also need to be taken into account in establishing priorities for action.

ILLUSTRATION D8 - SCHOOLS WITH MULTIPLE DEFICIENCIES

Showing the backlog of primary schools awaiting improvement in 1993

Based upon ECC Education Department Accommodation assessment. (See ECC Education Dept. 1994)

under privileged schools within the next few years if funding can be maintained.

2.4 EDUCATION PRESSURES

The primary education system in Great Britain has changed dramatically over the last 25 years as the post-war obsession with progressive teaching methods has been replaced by an emphasis on more traditional values.

Traditional teaching methods

The organisation of most primary schools in Great Britain up to the Second World War, placed great emphasis on the class teacher and instructive methods of teaching in cellular buildings with self-contained classrooms.

Most teaching was based around a class of about 40 children of a similar age with the class teacher covering the complete range of subjects, mainly within his or her own classroom, apart from occasional visits to the hall for more robust activities, such as physical education and music and movement, which needed a clear floor and greater area.

Much of the instructive teaching was carried out in an environment in which pupils sat at desks in rows, facing the teacher who had his own desk and blackboard at the front of class to enable him to show examples of work to the whole class which the children copied in one form or another. This is what is referred to by many teachers and politicians as the "Traditional method of teaching".

Progressive teaching methods

Progressive teaching methods using a child-centred approach were first promulgated by educationalists like the American John Dewey at the end of the nineteenth century, and were introduced into this country in the 1920s by people like Maria Montessori (Seabourne, M. and Lowe, R., 1971). She advocated that special apparatus should be used in schools to improve the child's discrimination of length, size, weight, shape, colour and texture, introduced in such a manner that children would be confronted by it.

This approach was designed to foster the sort of individual work advocated by many of her contemporaries, and it enabled children to work independently in the same room at the same time, but not necessarily at the same pace. She also advocated that the role of the teacher should be that of a guide and organiser, whose responsibility was to ensure that learning took place through interesting activity rather than the system of punishment and reward favoured by her predecessors.

This child-centred principle of education was developed by an American teacher, Helen Parkhurst, into the Dalton Plan based on the assignment system which replaced the orthodox timetable with a series of contract jobs consisting of pieces of work covering several different disciplines, which is the basis of today's project work in primary schools (Bennett, M,1980).

By the beginning of the Second World War progressive education based on the child-centred approach had caught hold in the teacher training colleges, and a lot of teaching based on individual and group work was evident in state infant and junior schools at this time, with a greater emphasis on collaborative work amongst teachers (team teaching).

The child-centred approach to primary school education was endorsed and encouraged by the report from the Central Advisory Council for Education in 1967, chaired by Lady Plowden, which emphasised the importance of preparing the whole child for life and not just exposing it to a machine for teaching. This report forms the basis of many of today's progressive teaching in primary schools (Plowden, Lady, 1967).

Most teachers and educationalists in Essex would agree that this County has not been at the forefront of progressive teaching methods, with most teachers being rather conservative, favouring more traditional teaching methods.

CHILD-CENTRED LEARNING

Essex primary teachers have, however, followed the national trend towards child-centred learning with teachers moving round the class dealing with pupils engaged in individual and small group project work. They have not, however, readily accepted the obvious link between these teaching methods and an open plan environment, as designers and teachers in other parts of the country have.

TEAM TEACHING

Many new Essex primary school teachers over the past 25 years have left teacher training colleges filled with a desire to pursue modern teaching methods including team teaching, this being the organisation of groups of pupils to work on multi-discipline themed projects outside the normal class structure resourced by a team of teachers.

They soon discovered, however, that the realities of Essex staffing ratios and difficulties of supervision, means that team teaching is almost impossible unless a like minded group of teachers is prepared to put a great effort into its implementation.

As a consequence, most primary school teachers have concentrated on the one class/one teacher relationship, based heavily on the classroom as the centre for most activities using a variety of whole class, individual tutoring, and group project teaching methods (French, C. P., 1995c).

EDUCATIONALISTS

Many of the more progressive teaching methods employed in primary schools have been sold to teachers by a group of educationalists, either nationally via the Department of Education or locally by a group of Advisers and Education Officers.

Generally the selling of such techniques within Essex has been limited, with Education Officers and Advisers being prepared to follow the teachers desire for more traditional methods, providing it produced a high quality education system which got results. Certain education officers have pursued the open plan concept, however, where they have seen the economic advantage of smaller schools costing less to build (French, C. P., 1994d).

ESSEX TEACHERS

Most primary school teachers in Essex have stuck to the classroom as their sphere of operation and have exercised an increasing resistance to many of the features of progressive teaching and open plan schools, including:-

- A reduction of exclusive classroom space due to the sharing of circulation space and coat storage, etc.
- Lack of aural privacy due to the transient nature of partition walls between classbases.
- Lack of visual privacy which allows some children to be easily distracted.
- Interruption of teaching activities by groups of pupils, teachers and visitors passing through their exclusive space, mainly due to a lack of pure circulation space.
- Centralised specialist facilities leading to supervision problems of small groups.
- Sub-division of classroom space amongst specialist bays making whole class teaching difficult.

National Curriculum

The National Curriculum was introduced into all primary schools in the maintained sector as part of the Education Reform Act of 1988, which ensures that all primary age pupils follow certain core subjects, whatever their situation.

This has not only reduced the flexibility in what is taught between individual schools, but introduced a need for new spaces for testing of pupils' progress, storage of work, records of achievement, and a plethora of forms and manuals.

PROGRAMMES OF STUDY

At primary school level, the curriculum consists of nine foundation subjects. At the centre are the three core subjects of English, mathematics and science. The other subjects are technology, history, geography, art, music, and physical education. A modern language may be offered in some primary schools, although it is not compulsory at this level. Religious education must be taught in all schools.

KEY STAGES

The eleven years of compulsory education are covered by four Key Stages, which at primary school cover the age groups listed below:-

Key Stages	Ages	Year
1	5-6	1
	6-7	2
2	7-8	3
	8-9	4
	9-10	5
	10-11	6

Pupils are tested at the end of each Key Stage to ensure they have reached the required standard before progressing to the next.

ATTAINMENT TARGETS

Attainment targets are laid down throughout the National Curriculum programmes of study in each of the subject areas, covering the knowledge, skills and understanding expected to have been achieved by the end of each key stage.

NATIONAL TESTS AND LEAGUE TABLES

Teachers assess progress and there are national tests for all primary school children at ages 7 and 11 comparing a school's pupils against a national average. The school is encouraged to publish the results of these tests annually to enable parents to compare the performance of different schools, known as the league tables, although there has been considerable controversy amongst teachers about the reliability and usefulness of such tables.

LOCAL VARIATIONS

Methods of implementation of the National Curriculum at individual schools are worked out by the head and teachers in consultation with their governing bodies.

The design of primary school buildings must, therefore, take account of not only the content of the National Curriculum, but also of possible methods of implementation, which will vary from school to school.

THE PHYSICAL REQUIREMENTS

The primary school curriculum has changed very little since the last war, but the introduction of the National Curriculum has seen a need for more storage of pupils' work for assessment and the introduction of more science and technology. This has produced a corresponding need for increased storage cupboards in classbases throughout the school, and the introduction of specialist equipment for science and technology. The increased use of computers throughout primary schools, with one or two now in each classroom, has also created a need for specially designed benching and mobile workstations.

2.5 THE OPEN PLAN MOVEMENT

The greatest single influence on primary school architecture in Great Britain during the last 25 years is the open plan movement. This movement developed naturally from three main factors :-

- The need for flexible space to accommodate the different size groups inherent with the progressive teaching methods which evolved after the war.
- The flexibility of division permitted by the new framed system buildings developed after the war.
- The economic pressure to reduce space standards in schools by avoiding pure circulation space and sharing as many functions as possible.

Flexible spaces

One of the main advantages claimed by designers for open plan schools was flexibility to arrange and rearrange classbases and specialist facilities to suit different teaching methods, class sizes, and groupings. In reality much of this flexibility has proved illusory, as teaching staff neither had the desire nor the time to rearrange their school. Many teachers have also said that the

environmental disadvantages related to this flexibility were too high a price to pay (French, C. P., 1994c).

MOVEABLE PARTITIONS

Partitions in open plan schools were either permanent, demountable or moveable depending on their function. (see illustration D9) In reality only the moveable free standing screens have been regularly moved in classbases and those required for aural privacy between classbases have remained in position. The schools provided with moveable partitions were not happy, however, with the loss of aural privacy as such partitions were seldom moved.

Many of the earlier open plan schools' classbases were also reliant on furniture to sub-divide them into working units for special activities, such as a Wendy house play area, story area or individual study area. The furniture was designed to be capable of use as a divider, often with a pinboard back for the display of children's work.

Later more cellular plans have divided classbases with walls or fixed amenities such as stores, toilets and coat spaces and furniture is not now so readily pressed into a dividing function.

MOVEABLE GROUPS

Most teachers have found it much easier to cope with changing curriculum and class sizes by moving groups around the school to rooms appropriate to their size, and have looked for variety in the size and character of spaces throughout the school.

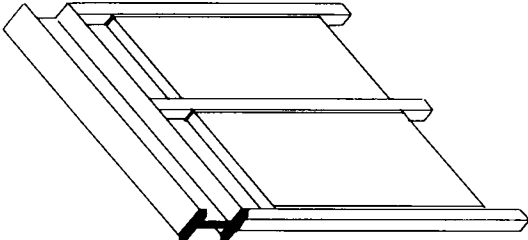
Conversely, other teachers have not wanted to split their classes into smaller groups located outside the classroom because of supervision problems, and have attempted to satisfy the demand for a variety of spaces by subdividing their own classrooms using screens and furniture (French, C.P., 1994d).

ENVIRONMENTAL CONTROL SYSTEMS

Designers of the earlier Essex primary schools were anxious that the internal environment of the school should be considered as a whole rather than as a series of enclosed spaces to give maximum flexibility in the placing of

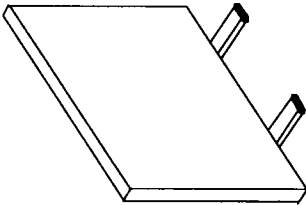
POST AND PANEL

Used to separate spaces
visually - moved occasionally



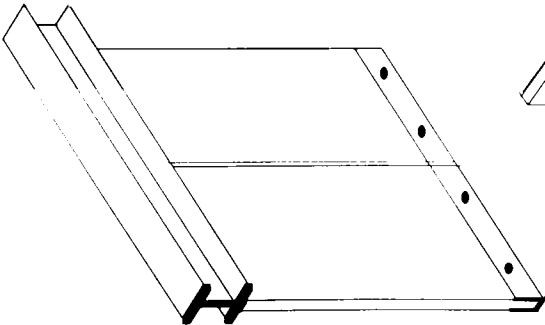
**FREE STANDING
WITH FEET**

Used to separate spaces
visually - moved frequently



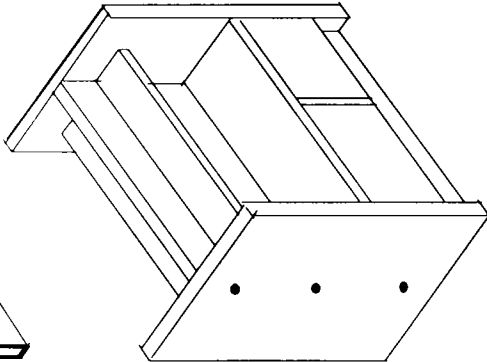
ACOUSTIC

Used to separate spaces
with different noise
regimes - moved infrequently



**FREE STANDING
U OR H PANELS**

Used to separate spaces
visually but with storage
facilities - moved
occasionally



Based on Essex range broadsheet
(See ECC County Architects, 1985.)

ILLUSTRATION D9 - PARTITIONING SYSTEMS
Showing the different types of partitions used in
open plan schools in the 1980's

partitions etc. They tended, therefore, to chose holistic heating systems such as warm air distributed through the ceiling void and delivered through ceiling grilles. Unfortunately these systems were designed upon the philosophy of unobstructed space for efficient air flow circulation, and many of the later partition configurations blocked the airflow, producing unacceptable ventilation and heating environmental conditions (French, C. P., 1994e).

Later open plan designs abandoned warm air in favour of radiators for heating, and opening windows for ventilation, and these produced better environmental conditions even when subdivided into smaller spaces.

It was also thought that the variable environmental conditions created by the different orientations of classbases would be dissipated throughout an open plan with its single volume, but this balancing effect was destroyed by the erection of partitions, giving underheated rooms in winter on the north elevation and overheated rooms in summer on the south elevation. Later more traditional heating systems were zoned in recognition of the increasing cellular nature of primary schools and these have produced more successful internal environments.

ELECTRICAL SERVICES

Electrical services for the earlier open plan schools were also conceived for a total volume, with little thought to the effect of greater subdivision. As a result lighting controls were often grouped together on permanent partitions, next to toilets or on columns, so that lighting controls for individual classbases were often remote and teachers found this to be very inconvenient.

Power points were also restricted to outside walls, permanent partitions around toilets and stores and on columns, restricting the use some items of equipment to certain positions in the classbase.

The later introduction of more permanent partitions between teaching bases helped to resolve this problem so that lighting controls could be adjacent to the bases and socket outlets more evenly distributed (French, C. P., 1994f).

Core facilities

Total flexibility within the open plan layout was in any case illusory as the number of fixed points within a school including:-

- The Hall
- The Kitchen
- The Administrative Suite
- The Toilets
- Sinks in Practical Areas
- Heavy Equipment requiring services such as Kiln
- Entrance Points

inevitably gave limited scope for the rearrangement of teaching spaces.

The early school plans overcame this problem by grouping fixed facilities together and spreading linked teaching around them in a free flowing space. The practical disadvantages of the strained relationship between teaching space and central facilities meant that this arrangement was not popular amongst teachers.

Later school plans acknowledged the importance of these relationships and fixed facilities were placed where they were needed to suit the day to day functions of the school.

Free span structures

Many of the constructional systems developed in Great Britain after the war had steel, concrete or timber frames. This gave designers a free span capability with very few load bearing partitions and maximum flexibility in layout. It also allowed the internal space to be subdivided with furniture or screens, with easy rearrangement when teaching practice or pupil numbers changed.

Deep plan

These same structural grids also allowed designers to use deep plan layouts around central halls or courtyards, with space efficient circulation patterns and direct links between teaching space necessary for the new progressive teaching methods like team teaching and project work.

Early open plan examples

School plans started to appear in Great Britain in the early 1970s where classrooms no longer had doors and corridors to connect them, but had pairs of classrooms, linked together with practical areas through which children passed to gain access to toilets and cloakrooms, such as the Amersham primary school illustrated in DES Bulletin No. 16 published in 1989. (see illustration D10)

This was followed by further development, particularly by LEAs in urban areas responsible for much of the system building of the time, where the primary school was split into various size spaces equipped for particular activities, such as wet/messy work or quiet study. This is well illustrated by the Eveline Lowe primary school which opened in Southwark in 1966. (see illustration D11)

American Barn Schools

The open plan concept for primary schools was taken to its ultimate development in the 1960s in the United States where large steel framed Barns were erected with very little subdivision at all, other than by screens and furniture.

One or two authorities attempted to copy the North American Barn schools by extending the open plan concept further by removing all the subdivisions in a free span structure and simply defining space using furniture and screens, a good example being the Eastgate C of E primary school in West Sussex opened in 1970. (see illustration D12)

Generally teachers were unhappy with the total open plan without subdivision, however, and very few of these were built in Great Britain.

System building

The move towards the totally open plan school was also promoted by the architectural fashion of this period where the Modern Movement had spawned new industrial systems of building. These naturally produced a load bearing, partition free, interior using structural steel frames and cladding systems erected on regular grids. This was complemented by pressures at this time to reduce the cost and area of schools which tended to produce deep plans with very little circulation space.

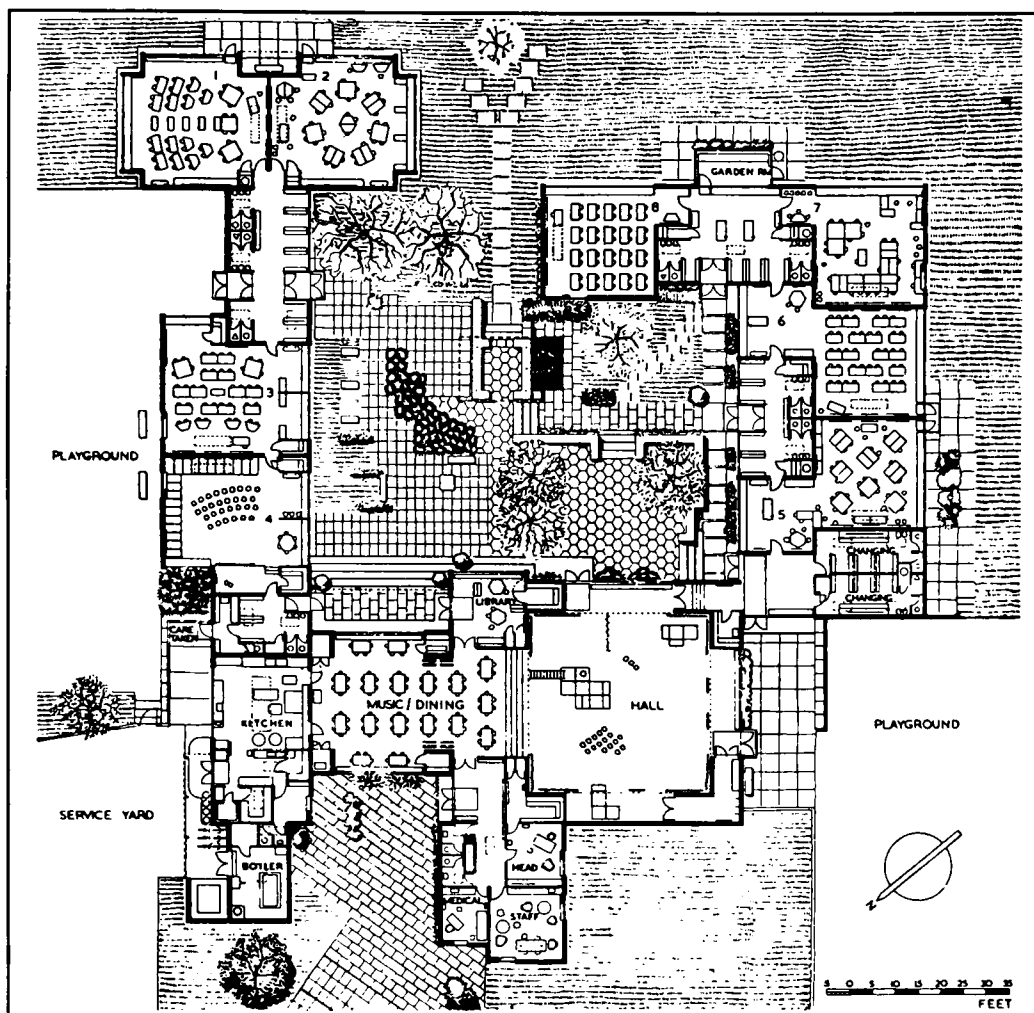


ILLUSTRATION D10 - AMERSHAM PRIMARY SCHOOL.
 Showing the linking together of class bases with shared
 cloakrooms and practical areas

Reproduced from *The English School : Its Design and Organisation* (See Seabourne, M., & Lowe, R., 1977)

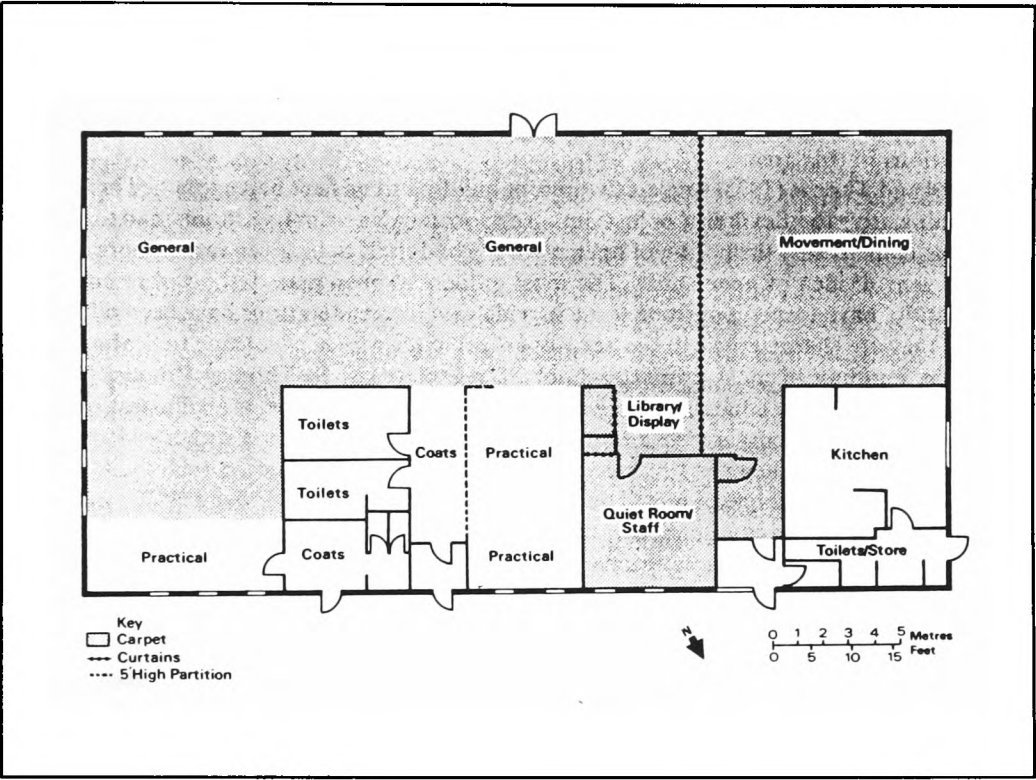


ILLUSTRATION D12 - EASTGATE PRIMARY SCHOOL
Showing an open plan layout without any permanent
partitions between class bases.

Reproduced from NFER publication
"Open Plan Schools"
(See Bennett, M., 1980.)

Essex Examples

Generally speaking the Essex experience from 1973 to 1993 reflected national trends, with most new schools in the early years having fairly open plans, followed by a gradual retrenchment towards more cellular plans as the period progressed. This is best illustrated by considering some typical examples :-

THE EARLY YEARS

Probably the three schools which demonstrate the full extent of open plan thinking in Essex are the North Crescent Primary School in Wickford, Elmstead Primary School in Elmstead Market and Cann Hall Primary School in Clacton.

North Crescent Primary School, Wickford

This 280 place suburban school was designed by Robert Maguire and Keith Murray in 1973, of a similar style to the highly publicised school completed at about the same time at Bow Common, London, and was very reminiscent of the North American barn schools (Architects Journal, 1972).

The main school consisted of a lightly clad steel portal framed agricultural barn, with a central core of toilets, wet areas, audio visual room and administration, with an upper teaching deck above. The 9 classbases were spread around three sides of this core, with a variety of floor finishes delineating quiet and practical activities, and low partition walls around storage areas separating bases. The volume of the school reads as one and it is possible to rearrange the boundaries of classbases by moving portable screens.

The hall, kitchen and boiler plant are housed in a separate pavilion linked to the main "Barn" by the entrance. The school found the open nature of the Barn almost impossible to operate, however, and the upper teaching deck has now been isolated by glazed acoustic screens. (see illustration D13)

Elmstead Primary School, Elmstead Market

The 180 place rural Elmstead Primary School was designed in 1972 by the County Architect's Department, and consisted of a simple flat roofed, system built box with the sunken hall and toilets in the centre, and 6 classbases arranged around three sides of the perimeter. The main entrance, kitchen,

dining area and administration suite were ranged along the other side enclosed with permanent blockwork partitions.

The area of the classbases had no partitions originally, apart from heavyweight curtains hung from the ceiling to divide the teaching space between pairs of classbases. The classbases were totally carpeted, with sinks mounted on the rear wall to serve the practical area. Access to the hall was by means of sliding folding screens which open onto classbases and the dining area.

The entire school, apart from the administration suite, is heated by gas fired warm air heaters mounted on the flat roof distributing warm air through a plastic pipe ducting system hung from the ceiling.

The school is constructed in the Essex County Council's own Modular Component System (MCB) of building, with castellated steel joists spanning from the precast lightweight concrete wall panels to the structural concrete blockwork surrounding the sunken hall, giving an entirely partition free classbase area.

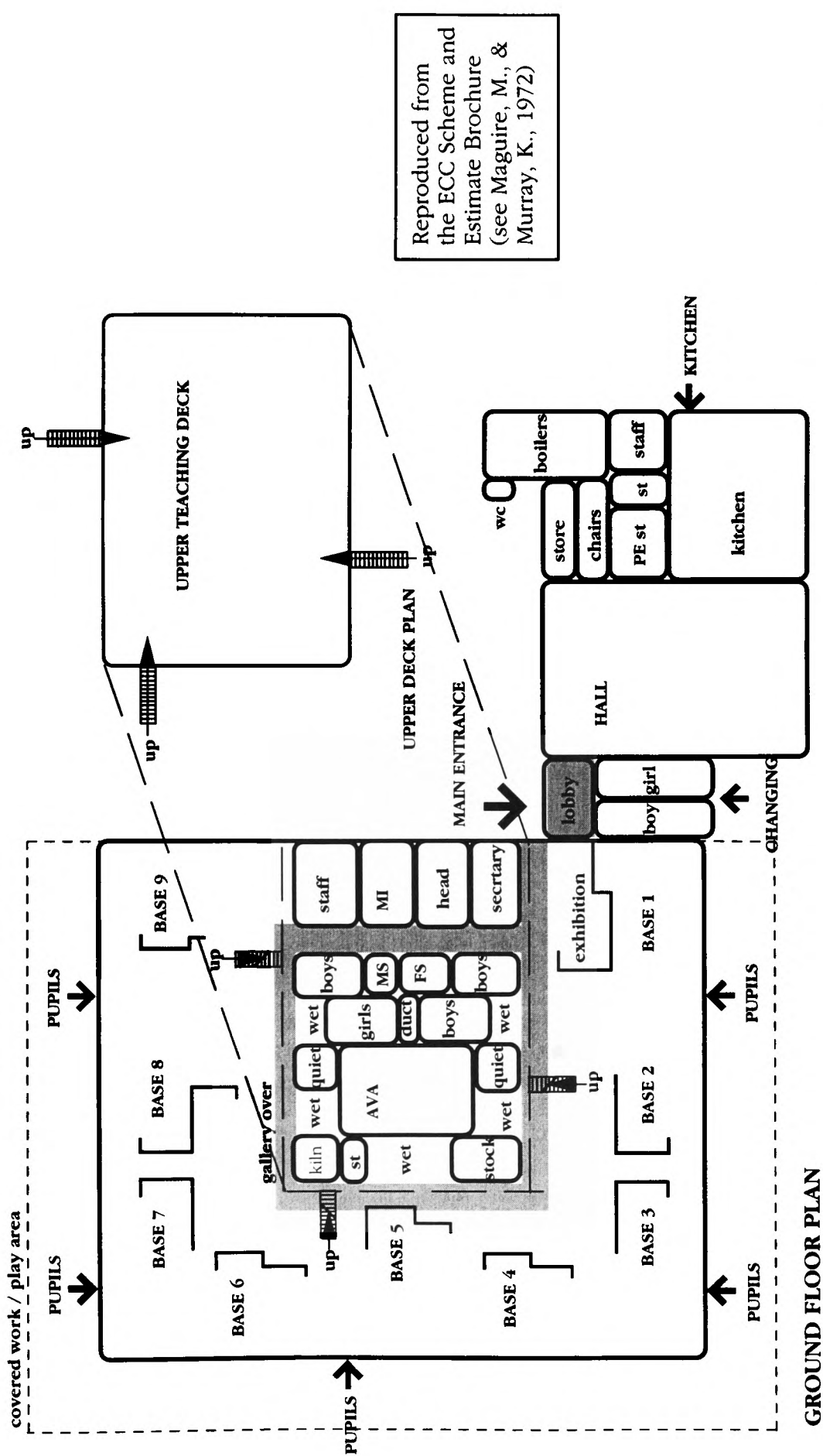
The original intention was that the teaching areas would be entirely flexible allowing the school to arrange the classbase layout to suit changing circumstances. The school has, in fact, changed the allocation of space by dining in the hall and using the original dining area for teaching, rearranging the existing teaching space to give a greater area per base, and to provide a small library area. They have also erected DIY partitions in timber and plasterboard to give a greater degree of aural privacy between pairs of bases and fixed coat storage facilities. (see illustration D14)

Cann Hall Primary School Clacton

Cann Hall Primary School was originally designed for 280 pupils in 1976 by the County Architect's Department with 8 classbases and a nursery unit. It was extended in 1987, however, with a further 6 classbases and the original school was remodelled.

The teaching accommodation is ranged around three sides of the hall and courtyard, with teaching bases grouped in two triples and one pair with shared practical areas between them. Toilets are provided in external "pods" adjacent to pupils entrances.

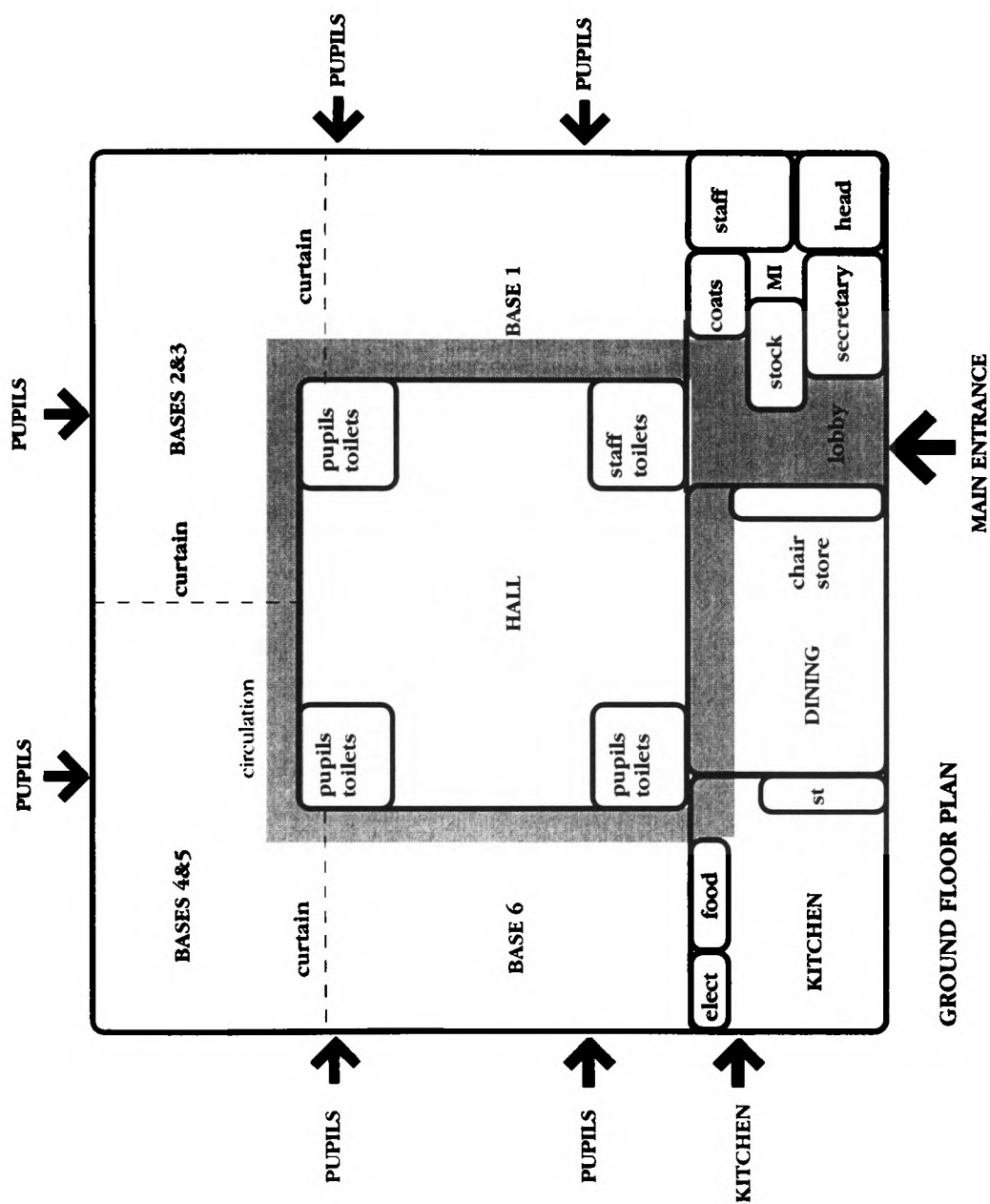




Reproduced from
the ECC Scheme and
Estimate Brochure
(see Maguire, M., &
Murray, K., 1972)



ILLUSTRATION D13 - NORTH CRESCENT PRIMARY SCHOOL, WICKFORD
Showing an early open plan layout reminiscent of the
North American "Barn" Schools



Reproduced from
the ECC Scheme and
Estimate Brochure
(see ECC County
Architects Dept, 1972.)



ILLUSTRATION D14 - ELMSTEAD MARKET PRIMARY SCHOOL
Showing an early open plan layout with few divisions between classbases

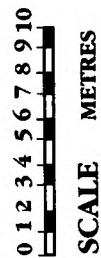
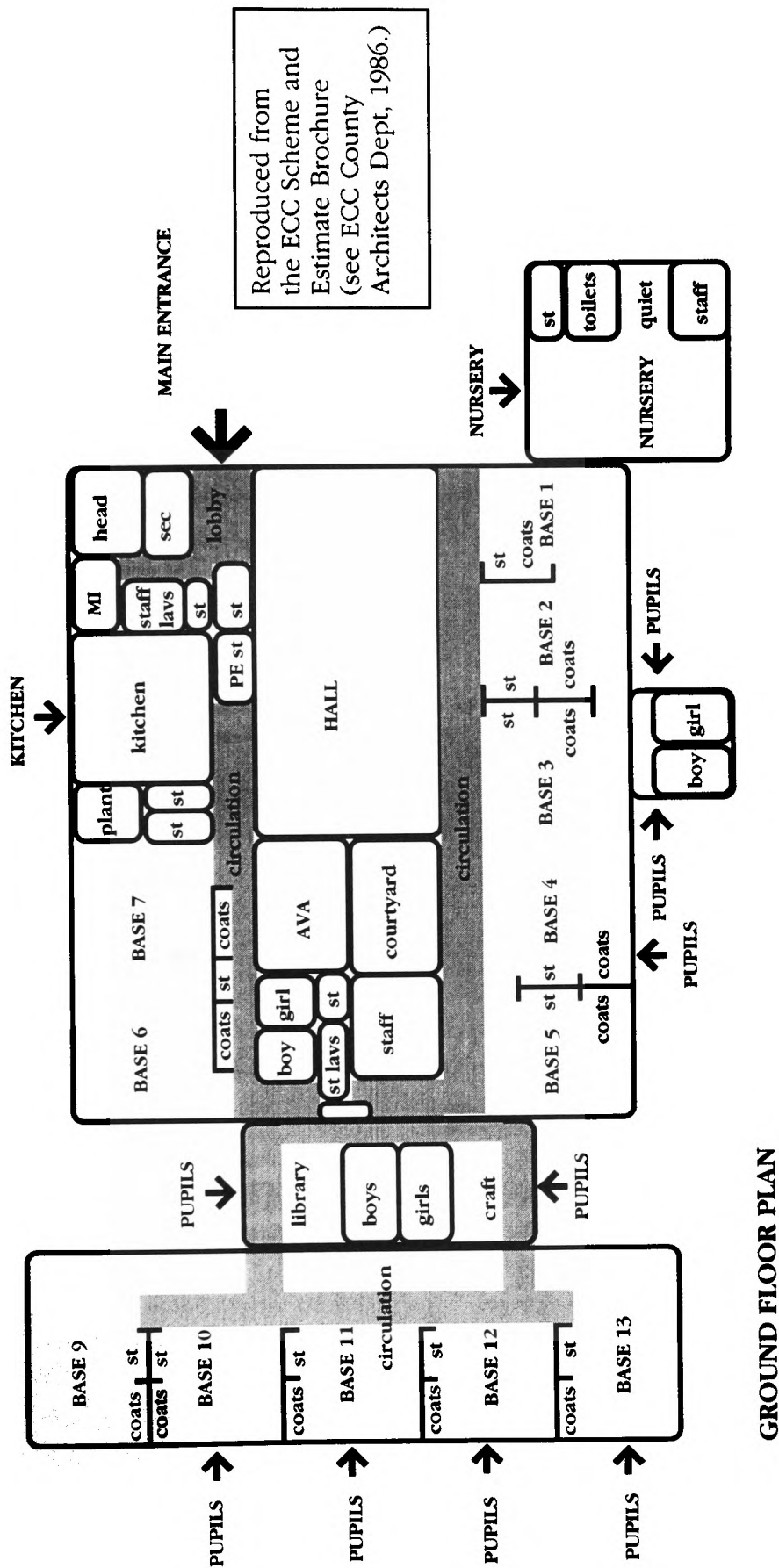


ILLUSTRATION D15 - CANN HALL PRIMARY SCHOOL, CLACTON
 Showing an open plan layout with class bases sub divided by lightweight demountable partitions.

Again the MCB structural system and warm air heating system give total flexibility, and subdivision of space is variable using demountable timber framed coat stores and partitions, with the intention that teaching spaces could be redefined as necessary to suit changing requirements.

The only permanent concrete blockwork partitions define the hall, kitchen, administrative spaces and the audio visual room.

Circulation was through the hall and around the core through teaching bases.

In fact, the demountable partitions have only been resited once in the life of the school, during the construction of phase two, when all the existing classbases were linked into pairs, and practical areas were resited between them at the rear of the bases. The opportunity was also taken to resite some of the storage/coat store dividers to form a dedicated circulation route from the front to the back of the school from the hall. (see illustration D15)

THE MIDDLE YEARS

As the decade progressed, the resistance of teachers to open plans with their poor sound division between classbases, and flexible warm air heating systems, started to assert themselves and plans became more cellular and services more traditional. Two schools which demonstrate the variation in approach are Barnes Farm Junior School, Chelmsford and Nabbotts Junior School, also in Chelmsford.

Barnes Farm Junior School, Chelmsford

This school was the first phase of a primary school built to serve a new housing area known as Chelmer Village. The first school on site was built in 1979 as a 280 place 9 base junior School, but initially used as a primary school until the infant school was built next door in 1987.

The school was once again constructed in the MCB system of building, in a simple flat roof square block format with a hall on the perimeter and large covered courtyard or atrium in the centre. Classbases were arranged on all four sides of the plan in pairs, each sharing a small group/quiet room and divided by toilets and/or coat storage bays. Shared practical areas were arranged at the rear of the teaching bases spilling out into the covered glazed atrium.

All of the partitions were in permanent blockwork dividing the classbases into specific areas for quiet individual work, large group work and messy practical work, including specialist areas for cookery and pottery etc. Circulation to the hall was via the atrium from the rear of classbases.

The teaching bases proved to be rather small, however, for the larger junior pupils and several of the partitions forming the group rooms have been demolished to give greater flexibility to class boundaries.

The school is heated traditionally by a gas fired boiler serving wall hung radiators and ventilated by opening windows, all of which have produced sufficient flexibility and adequate comfort conditions. (see illustration D16)

Nabbotts Junior School, Chelmsford

Nabbotts Junior School built in 1983 was the second phase of a primary school originally built in 1976 to serve a housing area known as North Springfield.

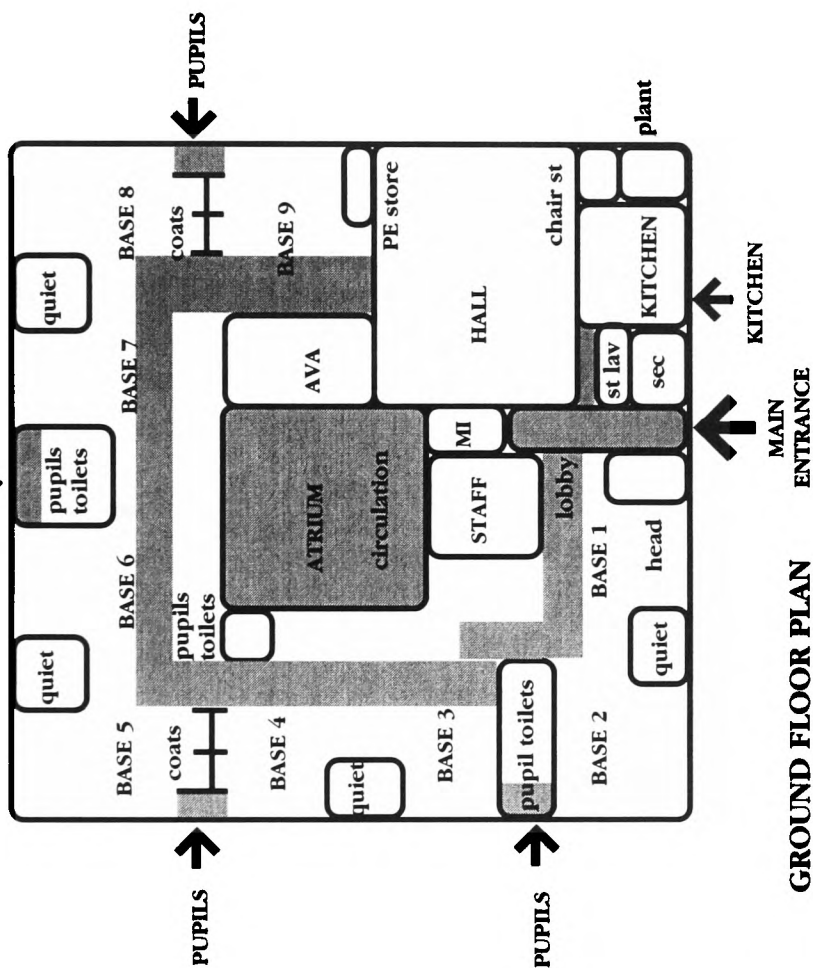
The new school was for 240 pupils with 8 bases and the existing primary school reverted to a linked infant school. The new school was built in two wings of MCB construction either side of a lightweight steel framed hall and glazed atrium.

The teaching bases are arranged in two pairs of bases either side of the atrium, with quiet rooms and toilets separating pairs of bases, and concrete block partitioned stores separating individual bases. It is possible, however, to connect two pairs of bases by opening a sliding screen in the partition which divides them.

All shared practical areas are situated at the rear of teaching spaces and open onto the glazed atrium. Circulation and coat storage all take place in the atrium. None of the partitions have been moved or demolished and no new ones added since completion.

The traditional LPHW heating system and natural ventilation system both appear to give adequate comfort conditions and flexibility, apart from some zoning problems due to orientation (see illustration D17).

CHANGING

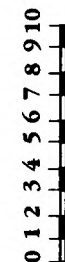


GROUND FLOOR PLAN

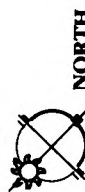
MAIN ENTRANCE

KITCHEN

Reproduced from
the ECC Scheme and
Estimate Brochure
(see ECC County
Architects Dept, 1978.)



SCALE METRES



NORTH

ILLUSTRATION D16 - BARNES FARM JUNIOR SCHOOL, CHELMSFORD
Showing an open plan layout with quiet rooms dividing
class bases

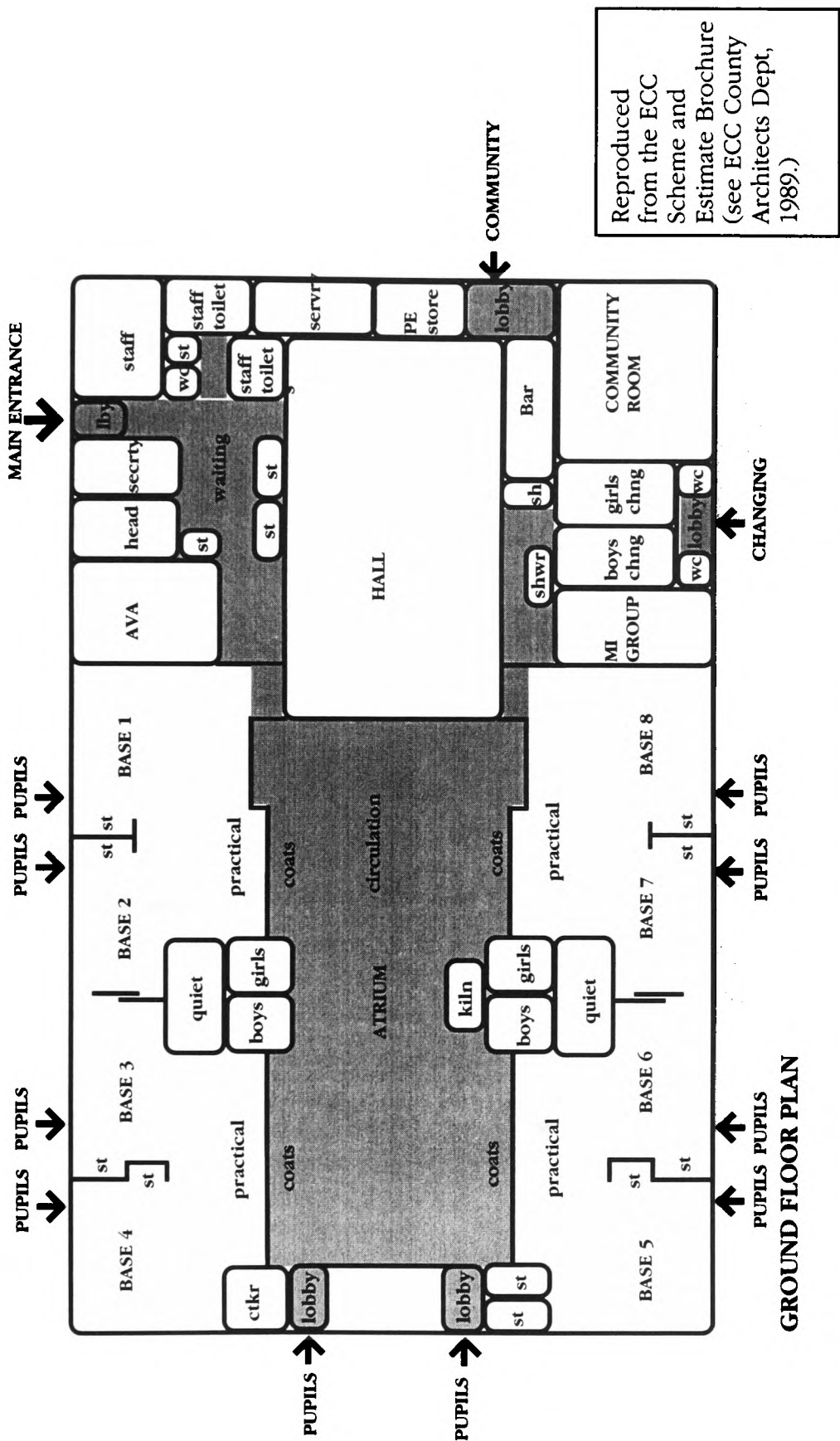


ILLUSTRATION D17 - NABBOTTS JUNIOR SCHOOL, CHELMSFORD

Showing a more cellular open plan layout with paired class bases divided by permanent blockwork partitions and quiet rooms

THE LATER YEARS

Essex primary schools in the later part of the 1980s and early 1990s, although clearly still open plan, became more formal in their circulation patterns, developing the concept of the atrium or street. Two good examples of this are Barnes Farm Infants School, Chelmsford and Shelley Primary School at Ongar.

Barnes Farm Infants School, Chelmsford

This is a 180 place 6 base infant school built on the same site as the Barnes Farm Primary School which reverted to its original function of linked junior school. The design is of traditional construction with two, open volume, pitched roof, blocks linked together by a glazed atrium. One block contains the hall, atrium and two teaching bases, and the other has four teaching bases arranged in two pairs.

The pairs of bases are permanently divided with concrete block partition walls providing storage, but they share practical areas which open onto the atrium. The two pairs of teaching bases in the larger block can also be joined together by opening a sliding screen. Toilets for pairs of bases are provided adjacent to practical areas.

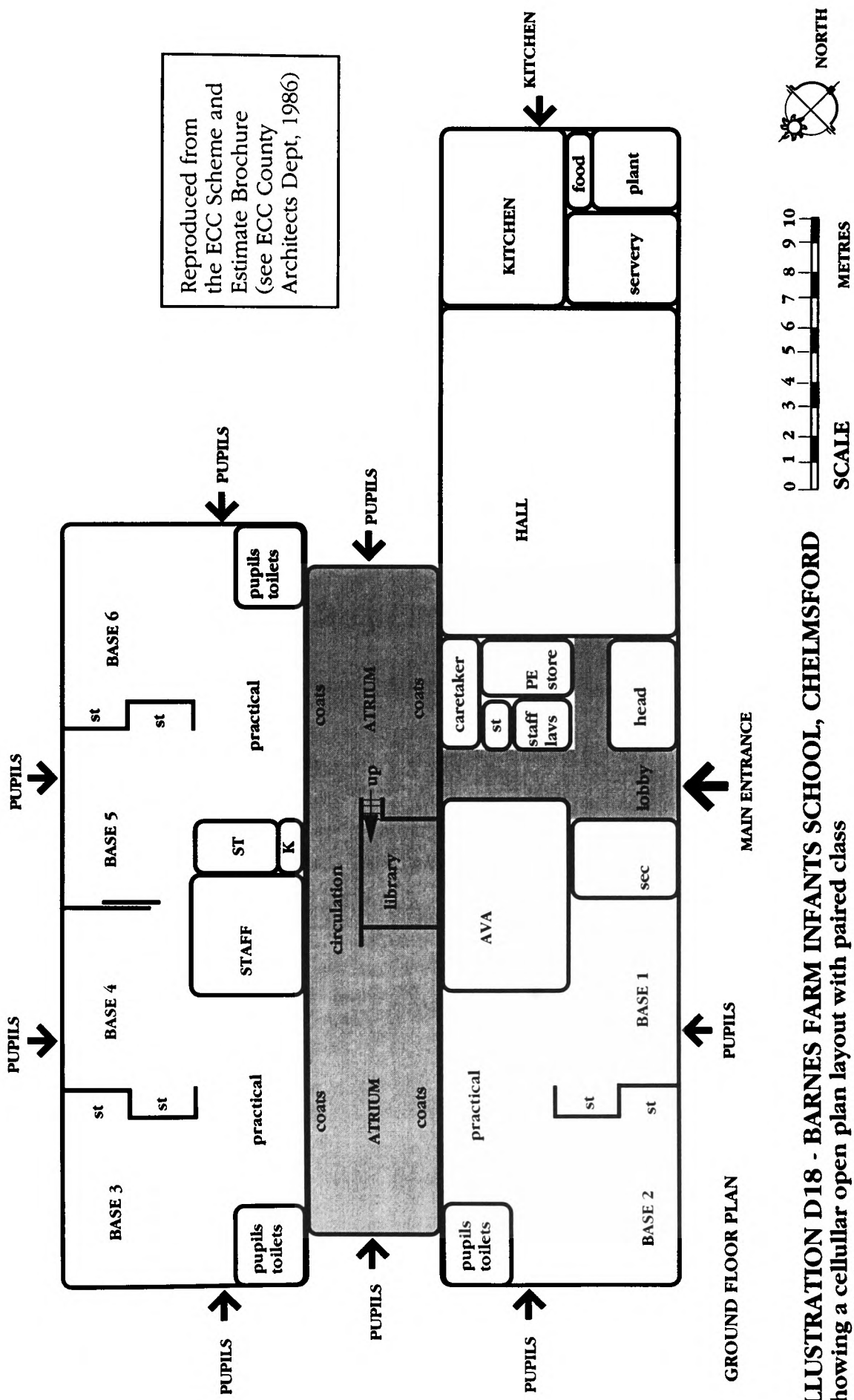
All circulation to and from the hall is via the atrium where coats are also stored.

Heating and ventilation are traditional, but the uplighters and roof lights make use of the open roof void between the roof trusses for light distribution between bases. (see illustration D18)

Shelley Primary School, Ongar

Shelley Primary School was built in 1993 to replace an existing timber framed school on the same site. It was designed as a 210 place 6 base school with the option for further expansion to a 220 place 8 base school. It is of traditional construction with a large single pitched roof with hipped ends spanning the entire school.

The plan is divided into two parts either side of the main entrance, with the hall, administration and community facilities to one side and the audio visual room and six classbases to the other. The classbases are arranged in one pair and two pairs either side of a central street or corridor. Pairs of bases are



Reproduced from
the ECC Scheme and
Estimate Brochure
(see ECC County
Architects Dept, 1986)

ILLUSTRATION D18 - BARNES FARM INFANTS SCHOOL, CHELMSFORD
Showing a cellular open plan layout with paired class
bases divided by permanent partitions.

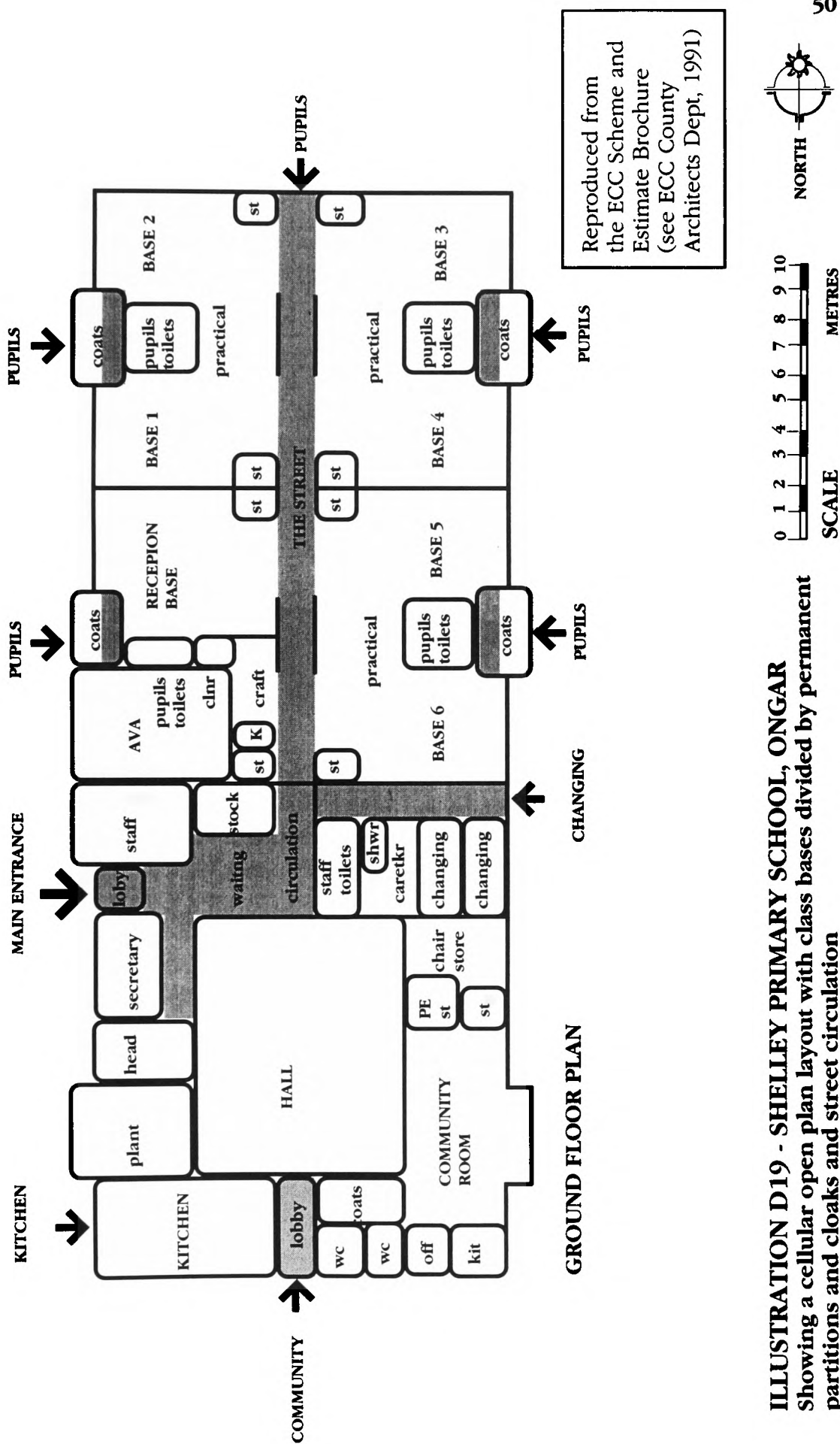


ILLUSTRATION D19 - SHELLEY PRIMARY SCHOOL, ONGAR
 Showing a cellular open plan layout with class bases divided by permanent partitions and cloaks and street circulation

divided by an entrance lobby and toilets enclosed by concrete block partitions with shared practical areas behind. Individual pairs of bases are separated by a concrete block partition to roof level, but they are open to the roof across the street.

The original design had fixed display screens between the practical areas and the street, but the school has supplemented these with sliding doors which complete the barrier up to lintel height to give greater privacy. The school is still unhappy, however, about the transfer of noise across the section from street to classbase, and classbase to classbase. (see illustration D19)

2.6 CONCLUSIONS

It is clear from this short study of the primary school education system nationally and in Essex, that certain political, economic and social trends have fashioned many schools and established current standards. Certain conclusions can be drawn when considering the future building programme including :-

- The political climate affecting the education system has changed dramatically during the last 25 years, with reduced support for progressive teaching methods and open plan layouts for primary schools. There has been a corresponding move towards more traditional teaching methods and cellular plan layouts nationally, but this is less marked in Essex because the county did not adopt the new liberal thinking as wholeheartedly as others. Clearly future school layouts need to be sufficiently flexible to accommodate any future changes in the political thinking around the education system.
- The open plan thinking of the 1970s which flowed from progressive teaching methods has had a profound influence on the development of the British primary school which is still evident in recent projects. This is particularly true of Essex primary schools which, although more cellular than other parts of the country, still exhibit many of the characteristics of the open plan schools, including shared resource areas, minimal circulation and linked teaching bases. It is important, therefore, to remember some of the more positive advantages of open planning as the politicians and teaching profession ditch the progressive teaching theories associated with open plan schools.

- There has also been a constant political pressure during the past 25 years to reduce public expenditure which has impacted on space and quality standards, apart from one or two short periods when the pressure was relaxed due to deflationary pressures. Politicians need to be reminded of the consequences of such short term thinking during any future squeeze on public expenditure.
- The ravages of inflation over the last 25 years has made the financing of school building very difficult and unpredictable, as Local Authorities resources have purchased less and less each year. The cyclic nature of the British economy has also added to these problems, as the construction industry endured wave after wave of boom or bust market conditions which made forward planning almost impossible. Although inflation has eased in recent years it seems likely that similar problems will beset the economy in future and budgets will still have to cope with the effect of inflation.
- Strict Central Government control over public expenditure has given local authorities very little freedom to determine their own priorities or standards, and they have been constantly battling to keep the numbers and quality of projects up to meet their needs. Inevitably this pressure has been felt acutely in Essex, with the County Council subsidising the school building programme from within its own resources, but only just being able to keep up with basic need, with improvements to existing schools having to wait. This has resulted in high levels of frustration amongst existing schools as projects are postponed for years and this undoubtedly explains some of the pressure to opt for grant maintained status. It is difficult to see, with current reductions in public expenditure, that the situation will improve in the foreseeable future.
- The post war progressive teaching methods have percolated throughout the primary school system in Great Britain. To a certain extent this has been resisted in Essex, but the basic principles of child-centred teaching by means of project work remains the basis of most schools method of operation. There is a current move from Central Government towards more traditional methods of teaching, including whole class teaching for certain subjects, which demonstrates that future primary schools need to be designed to allow for any teaching method to be used.

- The National Curriculum has impacted on Essex primary schools in the last few years, restricting what is taught locally with little time for some subjects and greater emphasis on others. Whatever the pros and cons of such restrictions it is clear that the designers of future primary schools will have a clear idea of the activities in the building wherever it is located.
- The open plan layout was introduced into British primary schools in the 1960s to give the flexibility of subdivision needed by the progressive teaching methods in vogue at the time. Unfortunately, it did not take the users of these schools long to discover that this inbuilt total flexibility, which they seldom needed, came at a price in terms of reduced environmental performance, and more cellular layouts with permanent partitions are now the fashion.
- Clearly there must be some advantages in using this plan form in terms of the close relationships between teaching bases, sharing of scarce resources and efficient circulation, for this layout to have dominated primary school design for so long. It is important, therefore, to keep some degree of flexibility within the primary school plan to cope with future changes.

Designers who ignore the lessons of history will find themselves repeating the mistakes of the past and wasting huge resources and time by reinventing the wheel. Hopefully this short historical review will ensure that future generations of designers learn from our recent past.

CHAPTER 3

THE ESSEX PRIMARY EDUCATION SYSTEM

3.1 INTRODUCTION

This chapter will look at the County of Essex and its recent history, how its primary education system has developed and is structured, teachers' attitudes, and specific Essex issues such as community involvement and the characteristics of its existing stock of schools.

3.2 THE COUNTY OF ESSEX

Basic character

Essex is a typical shire county in South East England with a population of around 1.5 million living in a mixture of communities from large concentrations of people in and around the main towns to the more thinly spread rural settlements.

It is a county with huge variations in its environment from the urban sprawl along the Thames in the South, through the suburbia of mid Essex, to the rural communities of North Essex. These dissimilar areas have their own particular characters which have created different types of school to suit varying environments.

Employment is very diffuse with centres of specialist employment such as the Defence Industry in Chelmsford, Automotive Industry in Basildon, Brentwood and Dagenham, the Army in Colchester and the International Airport at Stansted employing a large workforce. Mid Essex is also a large centre for the Insurance and finance Industries relocated from the City of London, and Colchester has a large number of printing companies. The rest of the county has a mix of farming, fishing and service industries typical of a shire county. (Essex County Council, 1993)

Urban Essex

Urban Essex is mainly concentrated along the Thames corridor in towns like Grays, Thurrock, Stanford-Le-Hope, Canvey Island, Benfleet and Southend and the North East suburbs of London. The centres of the larger towns like Chelmsford, Basildon, Harlow, Braintree, Clacton and Colchester also have their own urbanised areas around their commercial centres, however.

These areas usually have a mixture of high density housing and commercial property, served by Victorian and Edwardian primary schools built on "tight" sites with small classbases, small playgrounds and often no playing field.

They are normally of average size with a pupil population of around 300. Some of these sites contain a separate infant and junior school on the same site, however, increasing the number of pupils up to 600.

Suburban Essex

Suburban Essex has developed mainly since the last war around the established towns and post war new towns located predominately in mid Essex. These areas mainly consist of sprawling low density housing, and zoned industrial and commercial property.

Most Essex suburban schools have been built since the last war to serve the expanding populations around the larger towns and the New Towns. They are usually of average size between 250 - 350 pupils, and tend to have generous space standards with bigger classrooms and larger sites with ample playing fields. (French, C. P., 1995d)

Rural Essex

Rural Essex is the core of the mediaeval county with its farming communities interspersed with hamlets, villages, small market towns, and fishing villages and ports along the extensive coastline.

Rural schools are often located in or near villages and are small, Victorian or Edwardian in origin, many with fewer than 100 pupils, also on tight sites with limited outside play areas and detached playing fields.

Growth of the County

Essex is a county whose population has grown continuously since the start of the industrial revolution, and particularly since the Second World War. This has produced a corresponding growth in primary school pupil numbers which, although now slowed from the heady post war period, is still expected to grow from 94,300 in 1986 to 108,100 by the year 2001 (see illustration D20).

The population in Essex grew before the Second World War, mainly as the result of the industrialisation and urbanisation of the countryside, with the population leaving their rural occupations to live in towns like Colchester, Chelmsford and Southend, and to work in the many new industries created around these towns.

After the Second World War Essex was subjected to further growth from London overspill in the form of the two New Towns of Basildon and Harlow, and selective growth of towns such as Witham and Braintree, plus a modest countywide growth of population in most communities. This emanated from the demographic trend of families to have more children following the end of the war, with greater job security and prosperity. This general increase in population has shown itself particularly in the expansion of the suburbs of the larger towns of Colchester, Chelmsford and Southend.

3.3 PUPIL NUMBERS

It is clear from the data obtained from a survey of schools built between 1973 and 1993 that a large number of new schools were built during this period (26,700 new places in total). They were, however, distributed unevenly throughout the County of Essex with enormous variations in the number of new primary school places provided depending on location (French, C. P., 1995d) and pupil numbers have even fallen in some areas.

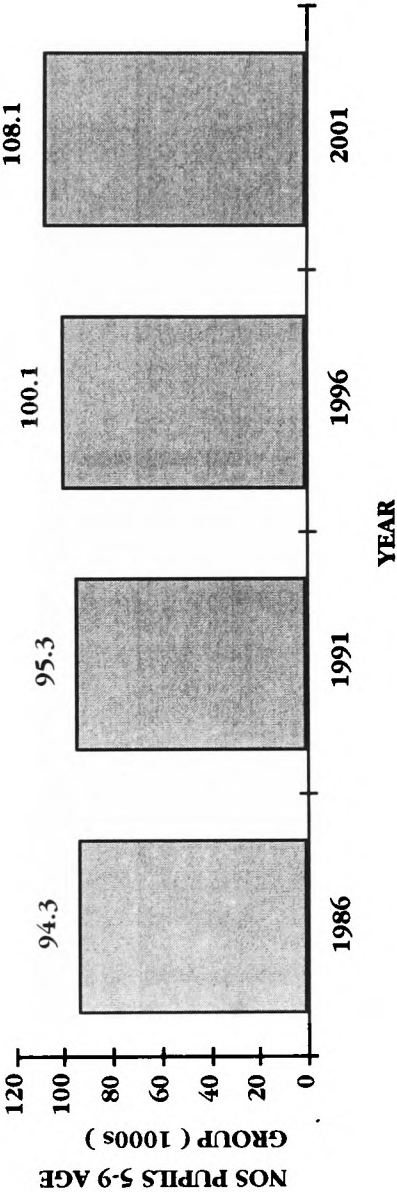
Areas of growth

To demonstrate this point, the number of new places and value of construction work were analysed according to the Area Education office in which the school was located. This showed that the County divided into three clear bands of growth as follows :-

NUMBER OF NEW PLACES

BAND 1		BAND 2		BAND 3	
N. E. Essex	5912	Mid Essex	4670	West Essex	2720
S.W Essex	5670	N.W. Essex	4200	S.E. Essex	2550

Forecast of average primary population throughout Essex showing steady increase until 2001. Pupil numbers in some areas will fall, however, due to demographic factors



Reproduced from *Building for the future* (see Essex County Council Education Dept, 1990)

ILLUSTRATION D20 - ESSEX PRIMARY PUPIL POPULATION

This pattern is also repeated when the total value of construction work over 20 years (updated to 1993 prices) is used as follows :-

TOTAL VALUE OF WORK

BAND 1	BAND 2	BAND 3
N. E. Essex £16M	Mid Essex £10M	West Essex £7.3M
S.W. Essex £12M	N.W. Essex £9.8M	S.E. Essex £6.8M

It is difficult to be precise about why there are such large variations between the different areas, but this is probably due to a combination of demographic growth in pupil numbers, size of centres of population, and the condition and capacity of existing buildings.

Growing Towns

It is interesting to note, however, that an analysis of the number of new places provided by location rather than just the Education Area, (see illustration D21) produces a different pattern more closely related to specific areas of growth rather than the general growth pattern of the areas in which they are located:-

NUMBER OF NEW PLACES IN MAJOR CONURBATIONS

GROUP 1	GROUP 2
Basildon 2040	Chelmsford 1220
Harlow 1720	Colchester 1220
South Woodham Ferrers 1270	Braintree 930
	Rayleigh 860
	Clacton 850
	Harwich 790

The three largest areas of growth in group 1 are all designated new towns which have all seen an influx of new families during the last 25 years. The next batch of towns with any significant provision are in group 2, and these are large centres of population which have also seen considerable growth throughout the same period.

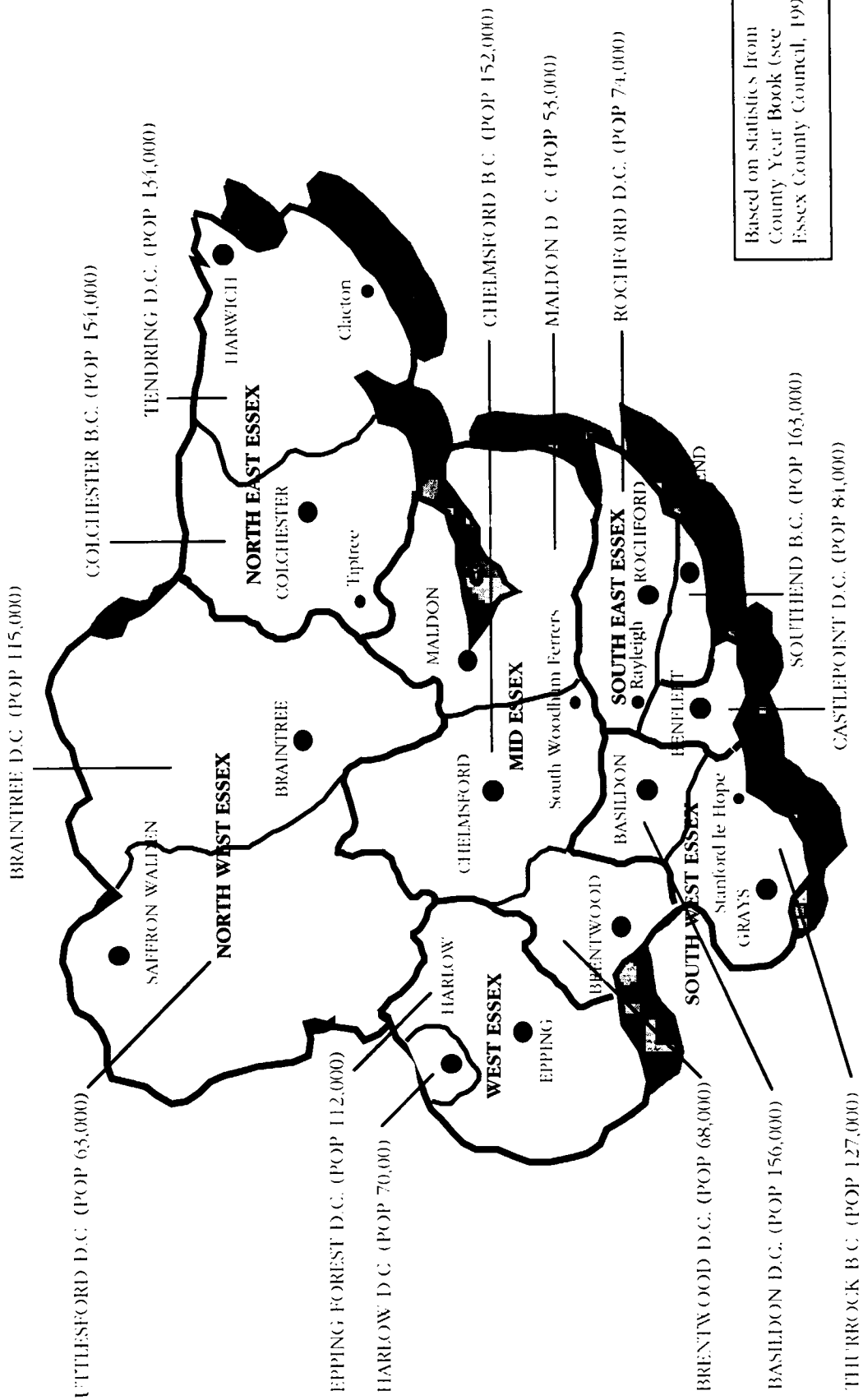


ILLUSTRATION D21 - MAP OF ESSEX SHOWING LOCATION OF EDUCATION AREAS AND MAIN TOWNS

Surprisingly there have been very few new places provided within Southend, which is the largest centre of population in Essex. The South East Essex Education Area, which serves this conurbation, has seen the lowest number of new places provided since 1973 throughout Essex. This is probably because the town was relatively well served with school buildings when it had responsibility for education as a County Borough, before local government reorganisation in 1974 transferred the service to Essex County Council.

There is now evidence, however, that Southend's large number of older buildings with their tight space standards are unable to cope with growing demographic demand, and the town is already playing a large part in the County Council's current Primary School Building Programme, although this responsibility will pass to the new Unitary Authority in 1998.

Surplus capacity

Growth in pupil numbers has not been consistent in recent years, however, with a considerable dip in the school population of certain areas mainly new towns, where a static population have grown older producing less children, or rural areas, where younger child bearing adults have emigrated to the towns. This has produced surplus capacity in some primary schools leading to a programme of school closures and amalgamations. The Ingatestone strategic review carried out in 1991 is fairly typical of the rural problem where pupil numbers serving four primary schools dropped from 416 in 1984 to 354 in 1990 with surplus places in all four schools. The County Council decided to close two of the more expensive schools to run and maintain, and consolidate the remaining two (ECC Property Services, 1991).

3.4 STRUCTURE OF THE PRIMARY SECTOR

Primary education within the County of Essex has generally been restricted to the age range of 5 to 11 years of age over the past 25 years. Nursery education has been offered to 4 year olds in certain urban areas and new towns, and the County Council has recently embarked upon a programme of nursery education throughout the county starting with the rising fives.

Number of primary schools

Essex has a total of 579 primary schools throughout the county which, until 1992, were controlled by the County Council. In addition to these numbers a small number of privately run schools are also available to parents prepared to pay their fees. (see illustration D4)

Nursery

Nursery education has been offered at certain schools, mainly in urban areas or the new towns, by the addition of a specialist nursery unit to an existing or new build infant or primary school.

The County Council had a programme of nursery units in the 1980s with three units built every year, and a special standard MCB design with a pyramid roof was developed to take advantage of economies of scale. Unfortunately, this programme only lasted 3 years before the funding was withdrawn and only 10 units were constructed in total. No further nursery units were constructed until recently.

The new Liberal/Socialist controlled council started the present programme of self-contained nursery units in 1994 aimed at taking all rising fives into infant schools by the conversion of spare accommodation, construction of new extensions, or provision of extra relocatable classrooms.

Primary

The most popular form of primary school in Essex is the all-age primary school, taking all children from the age of 5 to 11 years within its catchment area. The very small rural schools of 100 pupils or less have classes with mixed ages, but most primary schools have one or two classes of the same age group (forms of entry) throughout the seven years of the school life. Most primary schools organise their accommodation, however, so that the younger children are segregated from the older pupils.

Junior and infant

Some areas of the county have separate infants and juniors schools, the infant schools catering for children from 5 years to 7 years and the juniors from 7 to

11 years of age. Again, like the primary schools, they are of one or two forms of entry in size. These schools are mainly located in urban or suburban areas where the number of children from the catchment area justifies the cost of building and running two separate schools and avoids an over large institution.

Many of the separate junior and infant schools built during the 1950s, 1960s, and 1970s were constructed on the same site, however, sharing kitchens, plant rooms and playing fields to take advantages of economies of scale, with some schools having as many as 600 children on site.

Church schools

As with most shire counties many of the older Essex primary schools were started by local Catholic or Church of England (C of E) churches, with a religious emphasis in the curriculum, and a small proportion are still controlled by the church.

The two main categories are the C of E (Controlled) school, where the church owns the site and buildings but the County Council pays for the running of the school, and the C of E (Aided) school, where the church also runs the school but are financed from the County Council's Central Government allocation.

Many of these schools have detached playing fields, owned by the local authority, usually provided by the County Council after the school was originally founded.

Generally speaking, most improvements to church schools over the last 25 years have been funded by the County Council, but a large number of aided schools are now opting for GM status, with finance coming direct from the Funding Council for Schools.

Children with special needs

Recent Government programmes such as 'Care in the Community' are encouraging people with disabilities to live at home rather than in institutions, and to make full use of all types of community resources. (Department of Education and Science, 1984)

New primary schools are designed, therefore, with access to all parts of the building by disabled pupils, staff and visitors, and all projects must comply with Part M of the Building Regulations.

Changes in floor level must be avoided and it is normally expected that all accommodation in a primary school will be at ground floor level, as there is no provision in the Budget Model for lifts. If a change of level cannot be avoided because of site conditions then a ramp or wheelchair hoist is permitted.

A suitable cloakroom and changing area designed to mobility standards is also provided for disabled pupils, staff and visitors in wheelchairs.

The needs of disabled pupils must also be taken into account in external planning, not only in provision of appropriate circulation routes for those with mobility problems, but also for example in the selection of surface finishes, and scents from landscaping for the visually impaired.

3.5 SIZE OF SCHOOLS

The size of most Essex primary schools depends on the characteristics of the catchment area it serves, the number of pupils produced and the size of classes. Essex has had a large number of developing areas over the last 25 years, creating particular pressure in some parts of the county.

Catchment areas

Traditionally most Essex primary schools constructed in the last 25 years have been built to serve an area of housing in an urban or suburban setting. The Education Department have wanted to foster the concept of the neighbourhood school, and have tailored catchment areas to within walking distance from the school. The density of most housing developments would normally produce a child population of between 30 and 40 pupils per year and a one form entry primary school of between 210 and 280 pupils is the most common size in Essex. (French, C. P., 1994g)

Forms of entry

The ultimate size of any primary school will depend on the number of pupils in a class and the number of forms of entry. Most Essex primary schools are one or two forms of entry, which produce an all-age primary school of 210 or 420 pupils based upon a standard of 30 pupils per class.

Catchment areas, unfortunately, do not produce a child population in exact forms of entry each year, and schools have to be arranged to suit actual pupil numbers by varying the numbers of pupils in a year group, or by having a mixture of ages in some classes.

The Education Department provides a primary school to suit the expected numbers from the catchment area in multiples of 30 pupils, and leaves the exact arrangement of class sizes and age distribution each year to the Head teacher. Essex has, therefore, a mixture of primary school sizes ranging from 90 to 450 pupils to suit their catchment area.

Size of classes

It is interesting to note that class sizes in Essex primary schools have decreased consistently over the past 25 years, but are now starting to rise in some areas.

New schools were briefed for an average of 35 pupils per class in 1975, whereas the current brief envisages an average class sizes of 30 pupils, although as mentioned previously, the actual number will vary from year to year to suit the needs of the catchment area.

Many parents and teachers judge the quality of primary school education by the size of classes arguing that, the lower the number of pupils in a class the greater the attention which can be given to each child by the teacher. Recent Central Government statements have disputed this assertion, however, claiming that there is no correlation between class size and quality of education offered. (French, C. P., 1994h)

Predicting pupil numbers

The Education Department claim that it is very difficult to predict pupil numbers in some parts of the county, particularly those experiencing growth due to an influx of families into new housing.

It is true that schools serving new housing areas have great difficulty in predicting how many children will present themselves for education from a new housing estate, even when the exact blend of house sizes and social mix are known. This is because the child rearing potential of the new residents is uncertain until the houses are actually sold and the family situations known. The situation can be further complicated by parental choice, popularity of other local schools, and rate of completions.

New developments and bulges in pupil numbers

It is also well known that many new housing estates develop a bulge of children during the early years of their development, due to a preponderance of young families buying the new houses. This tends to settle down over the following ten years as the young families grow up or move on to larger premises. These are then replaced by a more normal mix of families, with and without children, until the estate settles into a lower sustainable pattern of child rearing.

Obviously the Education Department do not wish, or have the resources, to finance a school in permanent construction large enough to suit the bulge, as this extra accommodation could become redundant later, and they only build enough permanent accommodation to suit long term pupil numbers. The bulge of children is accommodated by providing short-life relocatable classrooms which can be sited near the main building for the duration of excess numbers, and removed when not needed. It is not uncommon for a bulge of children to occupy as many relocatable classrooms as permanent classrooms in the main school for many years.

Parental choice

Unfortunately, this problem has been exacerbated by the introduction of parental choice through recent legislation. This now means that families can send their children to popular schools outside their catchment area, often

leading to a situation where the popular schools have grown (mainly by the addition of relocatable classrooms) and the less popular are left to cope with under capacity and limited resources.

Phased developments

Sometimes the potential size of a new housing area may be such that it requires the construction of two or more primary schools, either built on separate sites or as two phases on the same site, often as linked infant and junior schools.

Unfortunately, due to a lack of resources, the Education Department often cope with increasing numbers of primary pupils by providing relocatable classrooms incrementally which remain on the site for many years, until it is forced to build the second school or second phase of permanent accommodation.

3.6 TEACHERS ATTITUDES

Essex primary school teachers are generally conservative in their approach to teaching and they have resisted the more extreme progressive teaching methods over the last 25 years. This conservative approach has also extended to the architecture of their schools, with resistance to open plan layouts and a preference for self-contained teaching spaces.

Progressive education

As mentioned in the previous chapter Essex schools have accepted progressive teaching methods reluctantly, but many young teachers joining Essex schools from teacher training colleges have, however, wanted to use the child centred teaching methods encouraged during their training in the classroom, provided that they could be exercised within the confines of the traditional classroom.

Team teaching

True team teaching in Essex is very rare and although many primary schools claim that their staff work as a team, it is unusual to see teachers sharing resources or teaching topics to several classes as a team.

Sharing resources

Most teachers would like to see resources within their classbase and under their control for:-

- Telling stories
- Quiet/individual study
- Larger group work
- Practical activities
- Specialist activities

and have complained in the past when these activities have been allocated to shared central spaces, especially when this has resulted in a reduction in their classroom size.

They appreciate, however, that it is not always possible or desirable for such facilities to be standing unused waiting for them to use them and are prepared to share with an adjacent base such things as toilets, practical areas, quiet rooms and even coat stores. This has been interpreted in Essex over the years into a successful policy of pairing classbases, with each pair having their own quiet room, toilets and practical area, and this still appears to work well with current designs.

Size of groups

There has been a considerable shift in policy towards the size and number of the groups of pupils for different activities within the classbase in Essex primary schools during the last 25 years as the policy on teaching methods has matured. In the early days of the MCB open-plan schools teachers arranged children in small and large groups to work on projects requiring large tables and extensive practical areas. Recent changes towards more formal teaching methods and individual study has led to the use of smaller individual tables, which can be rafted together, if needed, for group work, and the use of study bays.(French, C. P., 1994i)

Supervision

Many primary school teachers in Essex have said that they would like to use more progressive teaching methods including team teaching and sharing

facilities with other teachers, but find the pupil/staff ratios in Essex schools do not produce enough staff for the proper supervision of pupils working in spaces outside the classroom.(French, C. P., 1995e)

Maintaining Divisions

As mentioned in the previous chapter, Essex teachers have resisted open plan layouts and it is interesting to observe the instinctive action of teachers when moving from a traditional classroom based school into a more open plan school, even if bases are paired, when they still try to subdivide their teaching area from the adjacent base with furniture or free standing home-made screens or display boards. Fortunately, most of the younger teachers soon come to terms with the new layout and adapt their teaching methods to suit the different environment with barriers reduced to more acceptable levels. (French, C. P., 1994j)

3.7 COMMUNITY USE

Every primary school must develop a strong link with the community it serves if it is to successfully educate its children. This link works at two levels:-

- Establishing a rapport with parents and extended families through a variety of means, including parents evenings, parental assistance in the classroom, social events and school visits so that the education/learning process becomes a partnership between the teacher and parent.
- The use of the school grounds and buildings as a community resource so that the local community have access to valuable resources and develop a sense of ownership and empathy with the school.

School as the focus of the community

The primary school is often the only public building serving the neighbourhood with a space large enough for community activities, and most schools are extensively used by groups and clubs for a variety of purposes out of school hours. The majority of primary schools simply let the school hall to these groups at an economic rent, which is often a regular source of revenue for school funds. It has become the practice, therefore, to design the school

hall with the necessary fire precautions, toilets etc., to allow the school to obtain a public entertainment licence if needed.

Joint-use projects

Essex has also had a modest programme of joint use community provision in its primary schools during the past 25 years (15 schemes in total). This is where a local organisation such as the District Council, Parish Council or Community Association enhances the basic school facilities by contributing financially towards the cost of a larger school hall, committee room or changing rooms, etc., on the understanding that they will be allowed to use the accommodation out of school hours for its members or letting to the general public. These joint-use schemes have been extremely varied and include joint-use halls, libraries, and churches, as well as more extensive community and family centres.

A study of primary schools built during the last 25 years shows that most joint-use schemes took place between 1975 to 1986, however, with only one scheme completed recently. (French, C. P., 1995d)

It is surprising, given the obvious value for money presented by the joint use project, that more schemes have not been built, but this is no doubt due to a lack of money rather than enthusiasm for the concept by local organisations.

Joint-use hall

This is the enlarging of the school hall in area and often height, to allow for the playing of sports such as carpet bowls and badminton, social events, weddings, meetings, etc., and sometimes the addition of specialist accommodation, such as committee rooms, snack and/or licensed bar and changing rooms. This has proved to be the most popular form of joint-use development, and 8 such schemes were constructed during the 1980s.

Joint-use library

This is the construction of a Branch Public Library on the primary school premises which is shared equally by the school and community. The community benefits from its convenient siting and increased size due to the

school's financial contribution, and the school benefits from having the services of professional library staff on the premises and an extensive book stock.

Unfortunately, such opportunities for joint projects have been rare with only one such example built during the last 25 years which broke down as soon as the school achieved Grant Maintained status. (French, C. P., 1994k)

Joint-use church

This is where a local church congregation have built a new church on a site adjacent to and linked to the primary school hall to enable them to use the hall for social and fund raising activities out of school hours.

This arrangement appears to work well, as many school halls are not in great demand on Sunday when the church has its main period of activity. This form of development has been surprisingly popular with a number of church schools and 3 such examples were built during the 1980's.

Community centres

This is where the local Community Association contributes not only towards the enhancement in the size of the school hall, but also constructs a significant amount of extra accommodation with its own entrance, including a second hall, committee rooms, kitchen, bar and changing rooms to create a separate community centre. Such a centre has a full programme of events throughout the school day as well as normal out of school hours activities. There is, however, only one example of such an extensive development built in Essex during the last 25 years, although many of the joint use halls are run by community associations. (French, C. P., 1994j)

Family centres

This involves the construction of a meeting area, committee room, interview facilities, kitchen, etc., adjacent to the primary school hall by a District Council, usually in a school serving a new town or disadvantaged Urban Area. This accommodation is staffed by community workers during the school day to provide support to the families of young children by the provision of play group activities, life skills courses, counselling, etc., and out of school hours in conjunction with the school hall as a social centre for the surrounding

neighbourhood. Two examples of this form of development were built during the 1980s, but at least four others were planned but abandoned when the District Council withdrew its funding due to financial problems.

Outside spaces

Research by the Learning Through Landscapes Trust has shown that many of the staff, pupils, parents and the local communities' attitudes towards their local primary school is affected by the design and condition of its external spaces. (Young, K., 1990)

An interesting, stimulating, well-cared for external environment encourages visitors and pupils to respect the institution, and encourages a sense of ownership by the surrounding community. This often leads to fewer cases of vandalism of external features during and after the school day.

The primary school playing field is often the only open green space within a neighbourhood and community use of the outside spaces for sports, fetes and bar-b-ques reinforces this sense of ownership.

This can have certain negative effects, however, as any headteacher who has to contend with the aftermath of the local dog walking brigade will testify. Most Essex primary school sites are enclosed by a chain link fence with gates which are closed at night and at weekends to stop the dog walkers, the short cut to the local shopping centre and reduce vandalism. Unfortunately, this often gives the wrong signals to the local population who are not encouraged to take responsibility for security of the site out of hours. In reality the chain link fences are often constantly broken down along desire lines and access is maintained anyway.

Recent initiatives on the security of school grounds, discussed further in later chapters may lead to a less open environment for the local community. and some schools serving areas of high social need will undoubtedly see this as a regressive step.

3.8 EXISTING SCHOOLS

The Essex stock of primary school buildings reflects its shire county history, with a clear development of building types, from Victorian Board Schools in rural and urban communities to today's community primary schools serving large estates of owner occupier housing.

Building types

The early Victorian primary schools are very cellular, with small individual classrooms off a clearly defined system of corridors, spacious cloakrooms and a hall, usually built in a vernacular style with red brick walls and slate or tile roofs.

The post war boom in school building throughout Essex produced many new schools in different styles of building, including timber and steel framed flat roof system building clad in a variety of materials. The first of these new schools were still basically classroom and corridor plans, however, but with more generous space standards.

This was followed in Essex by the building of several lightweight, steel framed, SEAC and heavier weight concrete panel, MCB, open plan, flat roof, system buildings described in detail in Chapter 6. These were deep plan with central courtyards, paired teaching bases and very little pure circulation.

The 1980s and 1990s saw the demise of system building and a return to more vernacular styles of building, with large span "barn" like structures over relatively deep plan layouts, retaining the paired and linked teaching base. This period also saw the introduction of the glazed atrium or street as secondary space for practical activities.

Remodelling and extensions

It is clear from the data collected during the research project (French, C. P., 1995d) that although 26,700 new primary school places have been provided since 1973 at least 30% of these projects were small extensions aimed at improving the standard of existing accommodation by the addition of a hall, replacement of toilets or relocatable classrooms, and did not increase the number of places available overall.

Much of this work has been in the form of small extensions to existing schools, in the form of a new block containing either a new hall with one or two classbases, a new hall on its own or separate classbases. There were 38 such projects built between 1973 and 1993 evenly spread throughout the period. Considerable remodelling of existing schools has also taken place during this period in an attempt to keep up with changing needs.

The way in which the extensions and remodelling has been carried out will be considered in more detail in Chapter 5.

It should also be pointed out that the slow down in the growth of primary school numbers throughout Essex, and the severe limitations on finance, will mean that very few new primary schools will be built in future. These will probably be needed to serve new areas of housing, but much of the Authority's time and resources will be spent on making better use of the buildings it already has, by means of extension and remodelling.

The "have's" and "have nots"

Unfortunately, as mentioned in the previous chapter, the severe financial pressures experienced by the Education Department in recent years, and a desire to spread their resources over as many schools as possible, often means that very little money is available for upgrading the existing schools. This often means that schools extended in recent times have some accommodation at current space and quality standards, while other parts of the school are housed in cramped facilities. This can induce a sense of envy and frustration amongst those who have to teach and learn in the defective premises, with little hope that resources will be found to rectify the situation in the foreseeable future.

3.9 CONCLUSIONS

Several valuable lessons can be gleaned from this short examination of the county of Essex and its primary school system including :-

- Essex is a growing county with large variations in the character of its urban, suburban and rural communities. This growth has produced considerable pressure on the number of primary school pupils, leading to large programmes of new schools and extensions since the war. Although the

rise in numbers has slowed in recent years there is still pressure to build some new schools and even more to extend and remodel existing in some parts of the county.

- Essex has seen considerable growth within the primary school population since 1973 generally, with new school places provided in differing quantities throughout the county, depending on demographic trends. This has been particularly marked in the New Towns and around the large conurbations. Although growth has now slowed this pattern of development is likely to continue with the addition of some hot spots such as the area around the rapidly expanding airport at Stansted.
- Essex has a well defined structure of infant, junior and primary schools, but a relatively weak nursery school provision which has only grown fitfully during the last 25 years. The recent initiative by the present County Council may see a marked growth in nursery provision if funding can be maintained.
- Church schools have also played an important role in primary school education, providing a specialised education with a religious emphasis. It would appear that the County Council could have a reduced influence over such schools in future if the trend towards GM status continues.
- A greater number of local primary schools are now educating children with special needs within the main-stream system in Essex, but numbers are still small. The associated move towards more accessible schools does provide better facilities for any member of the community, however, including parents with prams, the elderly, and disabled visitors and staff.
- Sizes of primary school vary throughout Essex from the rural one form of entry primary with 100 pupils on role, to the two forms of entry suburban primary with 480 pupils on role. and this is reflected in their organisation, character and architecture.
- Teachers in Essex primary schools have had a strong modifying influence on the extremes of progressive teaching in the County and the architectural forms which flowed from them. As a result Essex has developed its own

particular house style incorporating some of the better features of progressive teaching, but avoiding some of the worst.

- Community involvement in Essex primary schools has come in many forms during the last 25 years with its heyday, undoubtedly, during the 1980s, but the County Education Department are still committed to joint provision and every new scheme is examined to ensure that local communities are given an opportunity to partake in a joint scheme if they wish.
- The Essex primary education system has inherited a large number of existing school buildings some built in the Victorian and Edwardian period, but the vast majority built since the last war. Many of these buildings do not provide adequate accommodation for modern teaching methods and are deficient in space or specialist facilities. Unfortunately, the growth in pupil numbers since the war has meant that the County Council has needed to concentrate on providing new schools or expanding existing, with little of its scarce resources left to correct deficiencies in existing schools.
- Hopefully reductions in the growth of pupil numbers may make it possible to concentrate on some of these much needed improvements in future to avoid the frustrations experienced by the "have nots"

Clearly the basic nature of Essex and its primary school system has and will continue to exert a considerable influence on the development of its buildings and designers of future generations of Essex schools will need to understand the context in which they are working if they are to produce buildings in sympathy with these pressures.

CHAPTER 4

THE DESIGN TEAM

4.1 INTRODUCTION

This chapter will consider the role that the County Architect's Department and other members of the design team played in the construction of primary schools in Essex over the past 25 years, including clients, various County Council departments and other organisations involved in the design process. Each member of the team has made their own unique contribution, but the interaction between the whole team has also affected the way in which the users' needs have been interpreted, designs evolved and buildings constructed.

The consistent use of in house design teams over a substantial period has allowed a stable relationship to develop between client and design team and the evolution of the primary school environment which flowed from this arrangement will also be examined.

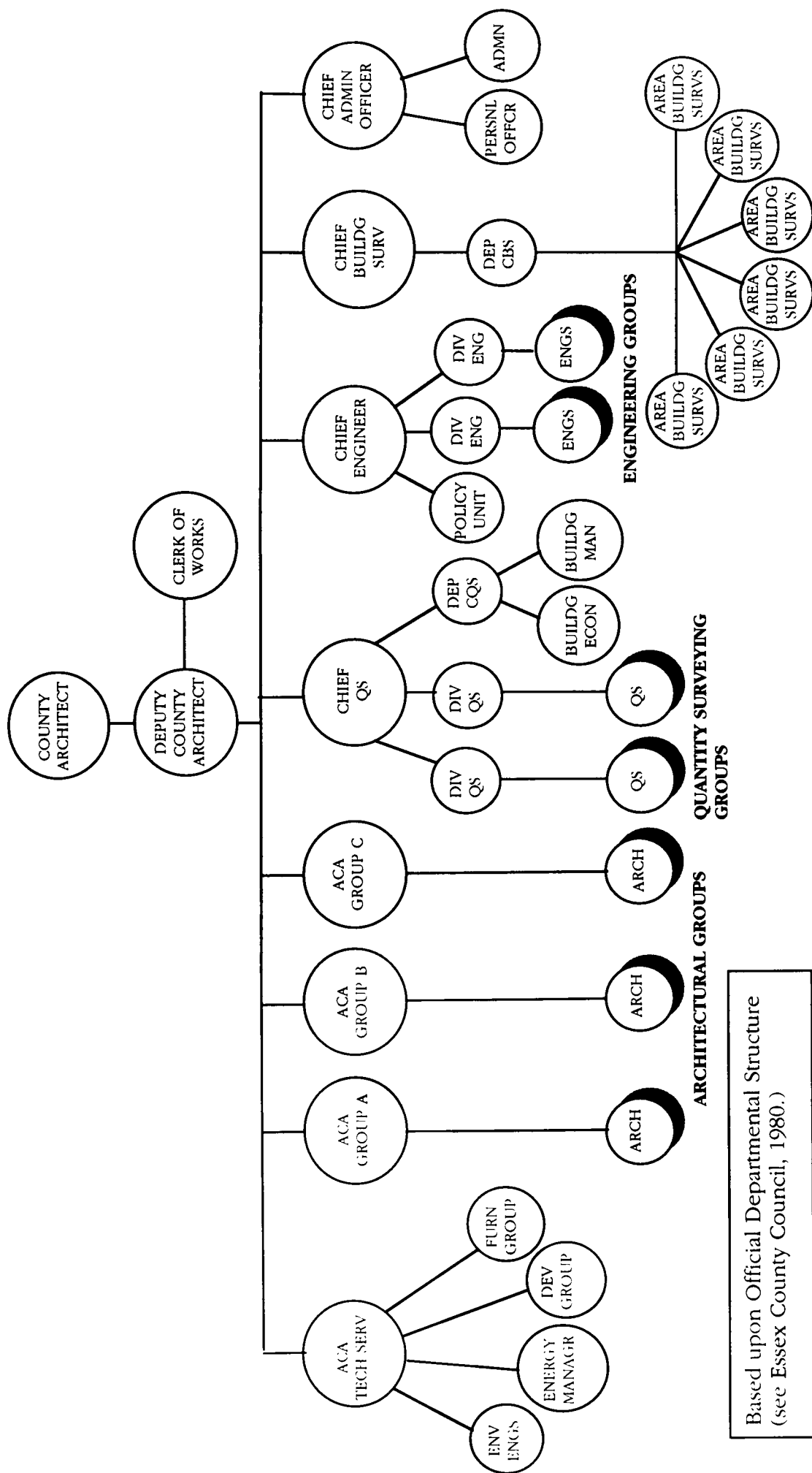
4.2 THE ARCHITECT'S DEPARTMENT

The County Architect's department has been responsible for the design of the majority of new primary schools during the last 25 years, apart from a few designed by consultants during the 1980s. The department employed the complete range of design professionals including Architects, Engineers, Quantity Surveyors, Landscape designers and Interior Designers who worked in multi-disciplinary teams on individual projects.

The structure and size of the Architect's Department

The County Architect's Department was organised along fairly traditional lines until the early 1980s (See Illustration D22), reflecting the normal separation at this time of the various building design professions, with teams of engineers, quantity surveyors, building surveyors and architects organised in professional groups with a chief at their head. The Architect's group leaders were designated Assistant County Architects and other professions had Chief Engineer, Chief Quantity Surveyor, etc. as their titular head.

The separate professions only worked together on individual projects, which were again traditionally organised, with the architect developing the concept of the building and the engineers and quantity surveyors advising on the services and cost of the building.



Based upon Official Departmental Structure
(see Essex County Council, 1980.)

ILLUSTRATION D22 - COUNTY ARCHITECTS DEPARTMENT STRUCTURE 1980
Showing traditional grouping of disciplines in self contained groups.

The department has been reorganised several times and has varied in size throughout this period, however, from a peak of over 500 professional, technical and administrative staff in the early 1970s as an Architect's Department with an annual capital workload of £45 million (at Oct 93 price base), to the current Property Services staff of 120 with a capital workload of £4 million (at Oct 93 price base), although many of these staff administer the consultants contract who are responsible for the remaining £40 million of the capital programme.(see illustration D23)

The department was amalgamated with the County Council's Estates Department in 1990 to form a Property Department, with Valuers and negotiators joining the other professionals to give a comprehensive property design, acquisition, management and maintenance service.

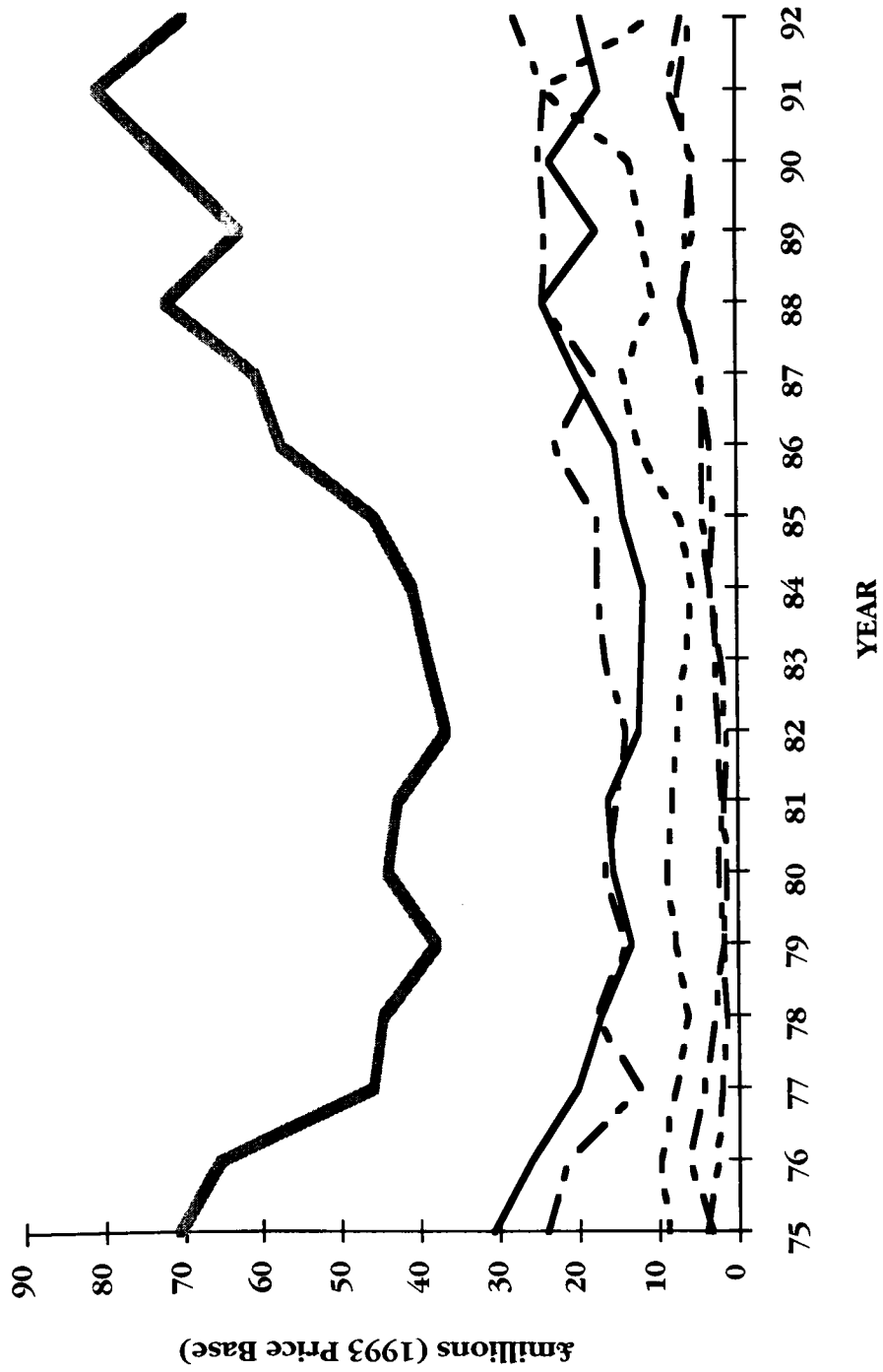
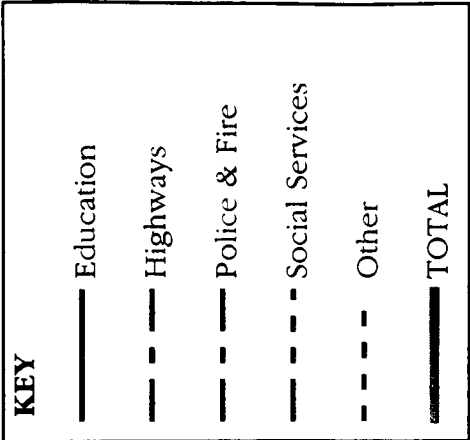
Most of the department's practice staff were transferred to W. S. Atkins in a trade sale in 1992 leaving a core of 120 staff to deal with 10 percent of the capital programme and all client functions.

Multi disciplinary design

The arrival of a new County Architect, Ralph Crowe and Assistant County Architect, Peter Page in the late 1960s saw the start of multi-disciplinary design within the department with the introduction of Environmental Engineers and a more holistic approach to the design of public buildings.

Peter Page was a strong supporter of the multi-disciplinary team where the Architect and Engineers worked together on the strategic design of a building, rather than the architect developing the concept and the engineers simply making it work.

The next County Architect, Alan Willis was also a strong believer in the multi-disciplinary design of public buildings and restructured the department soon after his arrival into multi-disciplinary teams, with a pastoral system of professional heads to ensure the strengths of individual specialisms was not lost. (See Illustration D24).



NOTES

All costs updated to Oct 93 price base.

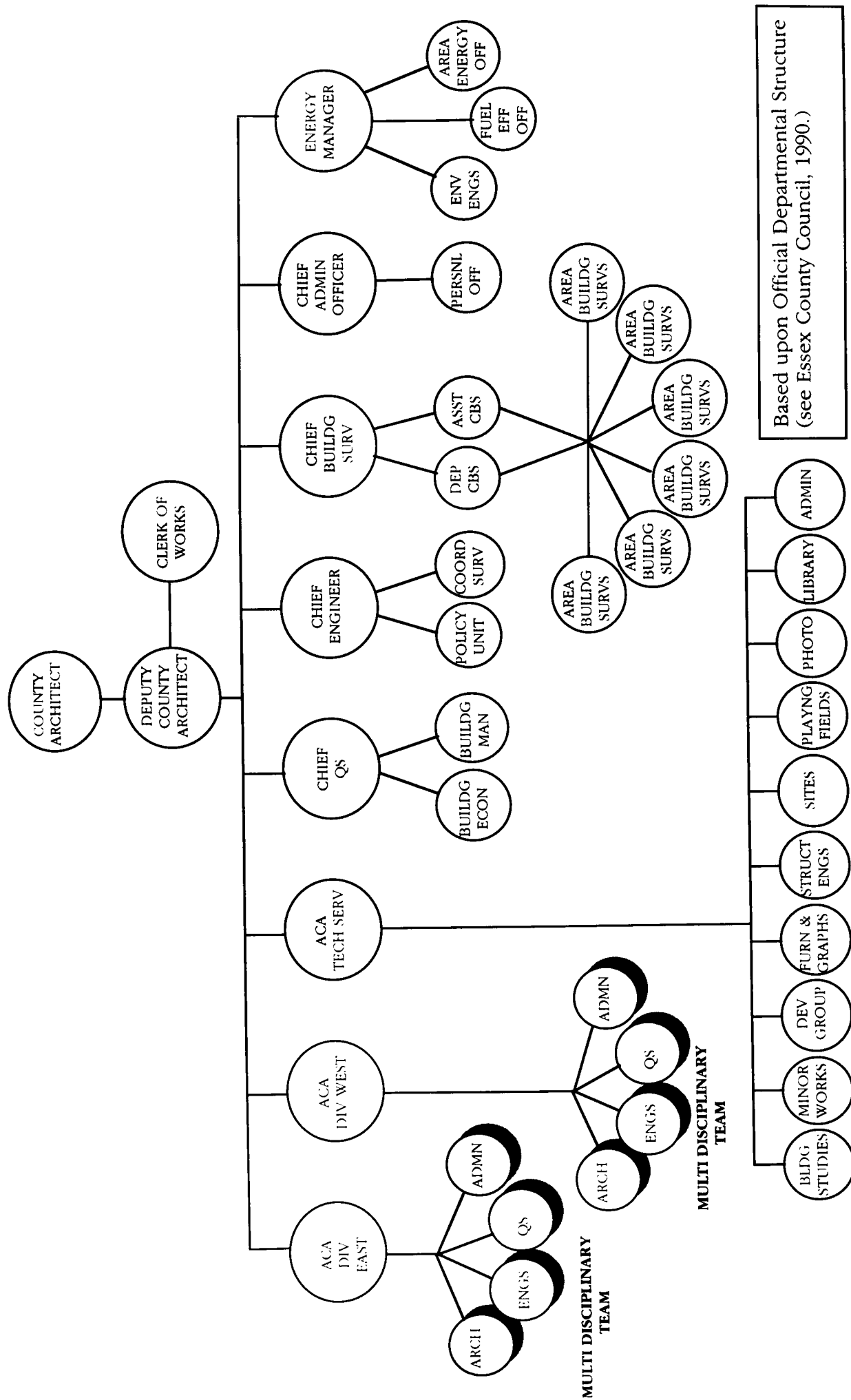
No design work for County Architects within Highways prog.

Chart covers all capital including equipment which is high for Police and Fire.

Other category includes Libraries, Courts, Planning, and payments for Dartford Tunnel.

ILLUSTRATION D23 - ECC CAPITAL EXPENDITURE (1975-92)
 Showing relative value of the Capital programme

Based on County Treasurers annual accounts (see Essex County Council, 1974-94)



ARCHITECTS

Most architects within the department have found multi-disciplinary design difficult as it can threaten the position of the architect as team leader and undermine his control of the design philosophy, unless he has the personality to use team spirit in a creative fashion. The Architect as promoter of team work is best illustrated by Barrie Page, who has been Project Architect and Development Architect for many of the development projects, which have all demonstrated a concern for good environmental design and multi-disciplinary working.

ENGINEERS

Most of the Department's Mechanical and Electrical Engineers, however, claim to have a strong belief in the craft of engineering and have stated that multi-disciplinary design is inefficient and dilutes the craft. Some of the engineers have successfully taken part in multi-disciplinary teams mainly involving development projects, but generally have not been prepared to actively promote the concept.

QUANTITY SURVEYORS

The department's quantity surveyors have become an indispensable part of the multi-disciplinary team, particularly as economic pressures have tightened budgets. The more traditional QS has found it difficult to give the more general cost advice needed by the design team, but those with well developed cost planning skills soon became an indispensable part of the team.

Unfortunately, not all designers have taken their advice willingly, and some professionals particularly the mechanical and electrical engineers and building surveyors, have preferred to control their own budgets.

LANDSCAPE DESIGNERS

Until very recently the layout and detailing of site works has been the responsibility of the architect, with advice from the landscape designer on soft planting. This was organised as a separate contract by the landscape designer, often as part of the playing field provision if provided.

This relationship has varied, however, depending on personalities, with some architects taking great care over the external spaces, and working as a team with the landscape designer from initial concept to detail design to achieve good quality external spaces within the resources at their disposal. Other architects have been less imaginative, leaving the detail of outside spaces too late in the design process, so that they often appear to be an after-thought, with the landscape designer left to do the best he can with limited resources. The abilities of landscape designers have also varied considerably, with many unable to contribute to the scheme at the formative stages and others uncomfortable with hard landscaping.

The building surveyors who have a considerable affect on external spaces when replacing pavings and fences or carrying out small extensions, have been particularly unsympathetic, and very few have seen the opportunities for improving the external environment.

INTERIOR DESIGNERS

The County Architect's project architects, furniture designers and the Education Department's project officers have had a complex relationship when dealing with the interiors of primary schools.

Project architects were generally responsible for the design and specification of fitted furniture and equipment such as coat storage, shelves, chalk boards, sinks, pinboard, etc., but the furniture designers advised on the selection of benching and storage units. They also scheduled the units and placed orders for delivery from the manufacturers, but the project architect had to make sure that the assembly of the benching and storage was included within the building contract.

The Architect's Department Furniture Group developed most of the standard range of primary school furniture and advised the CEO on colour and fabrics for the loose furniture such as tables, chairs, curtains and blinds, but the CEO's Furniture and Equipment Group placed orders direct through County Supplies for the items to be delivered to site and placed in position by the general contractor. Some other equipment, such as kitchen appliances, clocks and maps were also ordered directly by the CEO, but had to be fitted by the general contractor or connected to services by one of his sub-contractors.

This split of responsibilities for selecting, ordering and fixing of furniture and equipment between at least four different parties, caused considerable confusion and tension, with many items being ordered twice or not at all. This situation has been resolved recently by making the individual schools responsible for ordering their own equipment, but some confusion over funding is still evident.

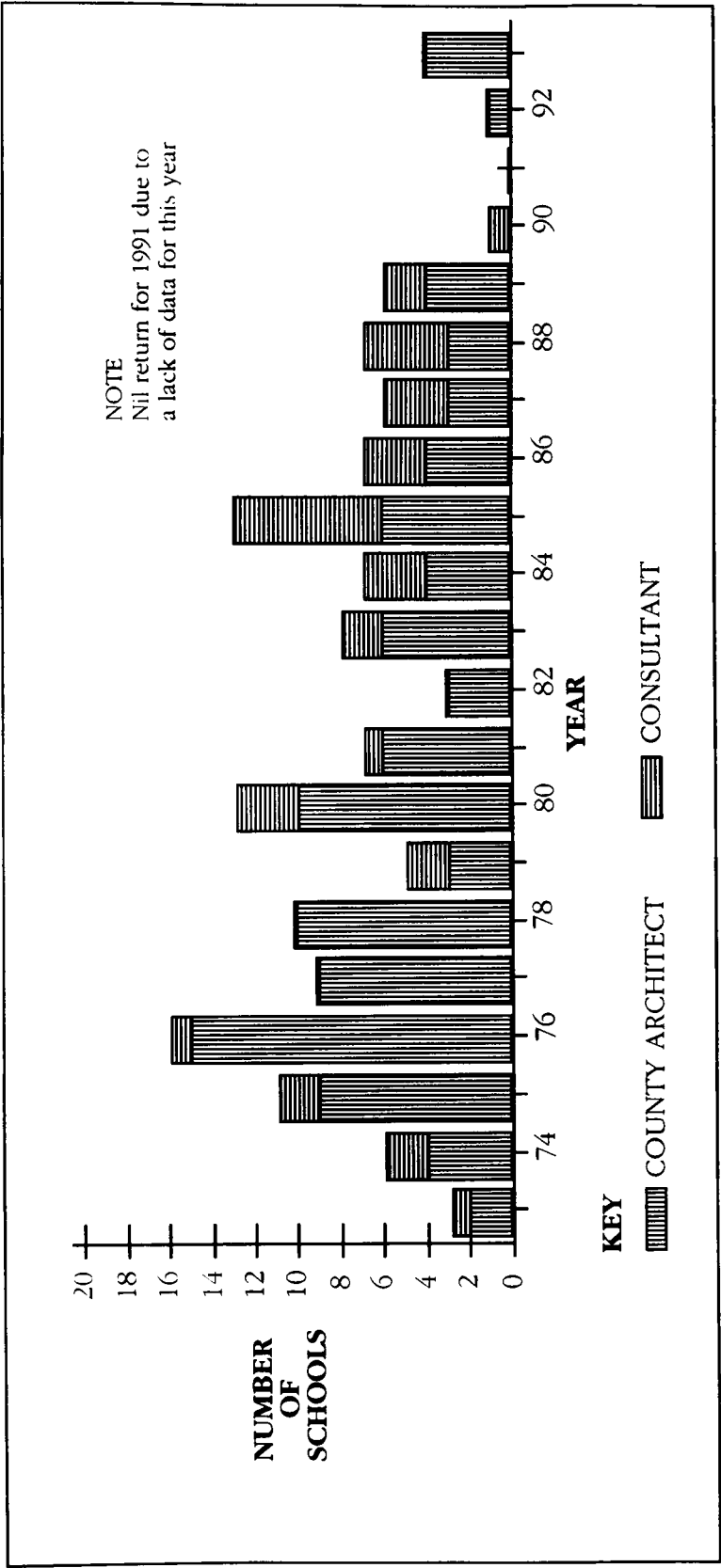
It is also only fair to point out that the Education Department did not always appreciate what they saw as interference from the Furniture Group in the selection of loose furniture, as all they really required was advice on design and colour.

Use of consultants

The County Architect's Department has had a policy during the past 25 years of, not only designing as many of the County's primary schools as possible, but also adopting a "mixed economy" by using a small number of consultant architects to gain the advantages of their fresh approach, and to smooth out the peaks and troughs of the school building programme.

This also avoided the need for a "hiring and firing" policy within the department which is so disruptive to the building of specialist expertise. An analysis of the number of projects designed since 1973 (See illustration D24) shows that the County Architects designed 106 projects worth £47 million (at 1993 price base) and consultants 37 projects worth £15 million, with many of the consultants' jobs being the smaller extensions. The use of consultants has been fairly consistent throughout the period, but with significant increases during the 1980 and 1985 peaks in the programme. Interestingly very few consultants were used during the largest peaks of work in the late 1970s, no doubt due to the considerable size and capacity of the department before it permanently reduced in size during the early 1980s. (French, C. P., 1995d)

It is also interesting to note the difference between the Essex policy of using a relatively small number of local practices with modest designs, to other counties such as Hampshire who have brought in the nationally known practice with striking designs.



Based on a survey of committee brochures
for primary schools built between 1973
and 1993 (see French, C. P., 1995d)

**ILLUSTRATION D25 - USE OF CONSULTANT ARCHITECTS
FOR PRIMARY SCHOOL DESIGN FROM 1973-1993**

Essex has used a few large practices of this type including; Maguire and Murray, Robert, Mathew, Johnson and Partners; Pollard ,Thomas and Edwards; and Greenburg and Hawkes, but somehow the promises of the partners at briefing meetings were never delivered and most have finished in acrimony.

Environmental Engineering

The study of primary school design in Essex over the last 25 years has demonstrated that one of the most significant factors in their design has been environmental performance.

This started in the early 1970s with the introduction of the MCB system which is discussed in detail in Chapter 6. One of the main objectives of the MCB system was to provide a better environment than that afforded by the light weight SEAC system, with its tendency to overheat in summer and underheat in winter, and considerable environmental design was applied to the MCB prototypes to reduce areas of glazing, improve insulation levels and control heat loss through ventilation.

This emphasis on environmental design continued throughout the programme of "Development" projects which followed even after the demise of MCB.

Assistant County Architect, Peter Page had a particular interest in the environmental performance of buildings, introduced the first Environmental Engineers into the Department, and encouraged the adoption of the TAS computer environmental modelling programme. Peter also encouraged links with the academic institutions such as Cambridge University and Cranfield Institute of Technology, which were able to take part in joint development projects.

The department's first energy manager was appointed in 1975 at the time of the "Oil crisis", and was able to institute large programmes of energy conservation by insulating properties, providing draught lobbies and better heating plant controls. He also started several energy conservation campaigns aimed at encouraging building users to switch off lights, close windows, etc.

Unfortunately, the current Energy Manager has the difficult task of justifying expenditure on energy conservation work, with diminishing pay back periods, during a period when the real cost of energy has been falling. He also has an even greater task in promoting the use of environmental engineering and thermal modelling amongst design teams, during a period when they are under increasing pressure to be more efficient.

The Environmental Engineers were skilled in the science of environmental services, with particular emphasis in energy conservation, insulation, daylighting, orientation, air movement and acoustics. They were encouraged to make a contribution towards the design process at the strategic stage when the architect was still dealing with concepts and objectives.

As part of this process they attempted to develop a computer based thermal modelling tool which would give simple solutions to basic design problems, such as changing the orientation of the building or the composition of its fabric.

The very early forms of computer programme developed with the Cranfield Institute of Technology required substantial computing power and were quite difficult to operate or understand. This was refined and developed over a number of years into the Thermal Analysis System (TAS), which was purchased by and until recently was in use within the department.

Unfortunately, the department's more traditional services engineers were not prepared to join multi-disciplinary teams, or spend much of their time on projects at the early strategic stage for a number of reasons:-

- They claimed that their fee scales did not provide sufficient remuneration for the early stages of a project, but were weighted in favour of the later detailed design phase.
- Electrical and mechanical engineers, unlike architects, were also responsible for maintaining services in existing buildings, and this revenue work had to be completed within holiday periods, often conflicting with the design period of capital jobs.

- Projects at various stages often altered dramatically as a result of changes of brief, or budgetary problems, and the engineers were happy to wait for the design to settle before committing their own resources to the project. The thought of having to redesign any part of their system as a result of a change in the overall design of the building, was an anathema to most engineers.

Relationship with the Education Department

The 1970s and 80s were characterised by a fairly large programme of work and pressure to progress projects speedily. As a result a very close working relationship built up between the Project Officers and Advisors in the Education Department and the in-house design teams in the County Architect's Department. This also extended to a selective band of private consultants who were used to take up the slack in the capital programme when the workload exceeded the County Architect's staff resources.

The close working relationship between client and design team over the last 25 years has expressed itself clearly within the design of primary schools, which was the most common building type constructed at this time.

The relationship had certain clear advantages:-

- Most designers had already worked on a primary school, were aware of the standards required, and would soon be told if their proposals were not acceptable when drawings were presented for approval.
- The briefing officers received instant feedback on the success or otherwise of their projects, and were able to modify the brief for the next project instantly, creating a self perpetuating briefing process.

Unfortunately, the relationship also had some disadvantages :-

- Familiarity led to some misunderstandings and difficulties in communications, particularly apparent when a new inexperienced in-house architect or consultant was appointed as project architect. Unfortunately, some of these misunderstandings were not discovered until the school was constructed, with project officers heard to say at the handover inspection,

"I did not realise that the toilets would look like that!, I thought you knew that we always have a layout like Highwoods in our primary schools".

- There were very few written briefing documents produced until recently, with undue reliance placed on the memory of certain key individuals in the County Education and Architect's Departments.

It is interesting to note that this close working relationship has already started to break down with staff transferred to consultants W. S. Atkins, with the Education department now producing very prescriptive briefing documents on the basis that design teams are making too many errors with current design standards.

Relationship with the schools

The somewhat detached relationship between school and Education Department, discussed later, was also reflected in the relationship between the individual schools and the Architect's Department.

Designers have always been encouraged to treat the Education Department as the client or landlord, and the headteacher and governors as the somewhat transitory tenant. This often meant that individual schools, headteacher or governors, had an expectation of the design team which could not be delivered because the Education Department were not prepared to support or fund particular design solutions.

This relationship has changed in recent years, however, with the introduction of LMS, as schools have exercised their new found freedom and power, backed up with their own resources to spend on buildings, often developing a closer working relationship with the design team.

4.3 DEVELOPMENT WORK

The County Architect's and succeeding Property Services Department has always had a strong development group who have carried out research and development work, mainly in the field of environmental design, by means of a series of "live" development projects where research has been incorporated

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into projects from the capital programme, many of which have been primary schools. (see illustration D26)

Development team

The very first development team was inherited by the department when Ralph Crowe withdrew from the SEAC consortium, and those members of the Department who had been working in Epping with the SEAC development team moved back to Chelmsford.

The development team's first task was to develop the new concrete panel Modular Component Building System (MCB) under Ralph Crowe's direction, and they spent many hundreds of hours working with consultant structural engineers perfecting the components and details of the system. They also had to arrange many different tenders and term agreements for the supply of the components.

As mentioned previously, they also worked closely with the department's environmental engineers to improve the environmental performance of primary schools amply demonstrated by the live development projects.

Development projects

Many of the development projects, and some that were not officially classified as such, involved the development of the primary school brief, it's planning and it's environment. A study of these projects shows a very clear evolutionary pattern with various themes of the period examined, tested, and either refined and repeated, or rejected as unworkable (French, C. P., 1995f) :-

ELMSTEAD MARKET PRIMARY SCHOOL (1972)

This was the first MCB primary school and was the prototype from which much was learnt. It had an almost perfect square plan with a central sunken hall surrounded on all sides by teaching bases. The teaching accommodation was totally open plan, with curtains being the only form of division.

The school had sealed windows and a simple roof mounted gas fired warm air heating system. with a plastic drain pipe distribution system hung from the

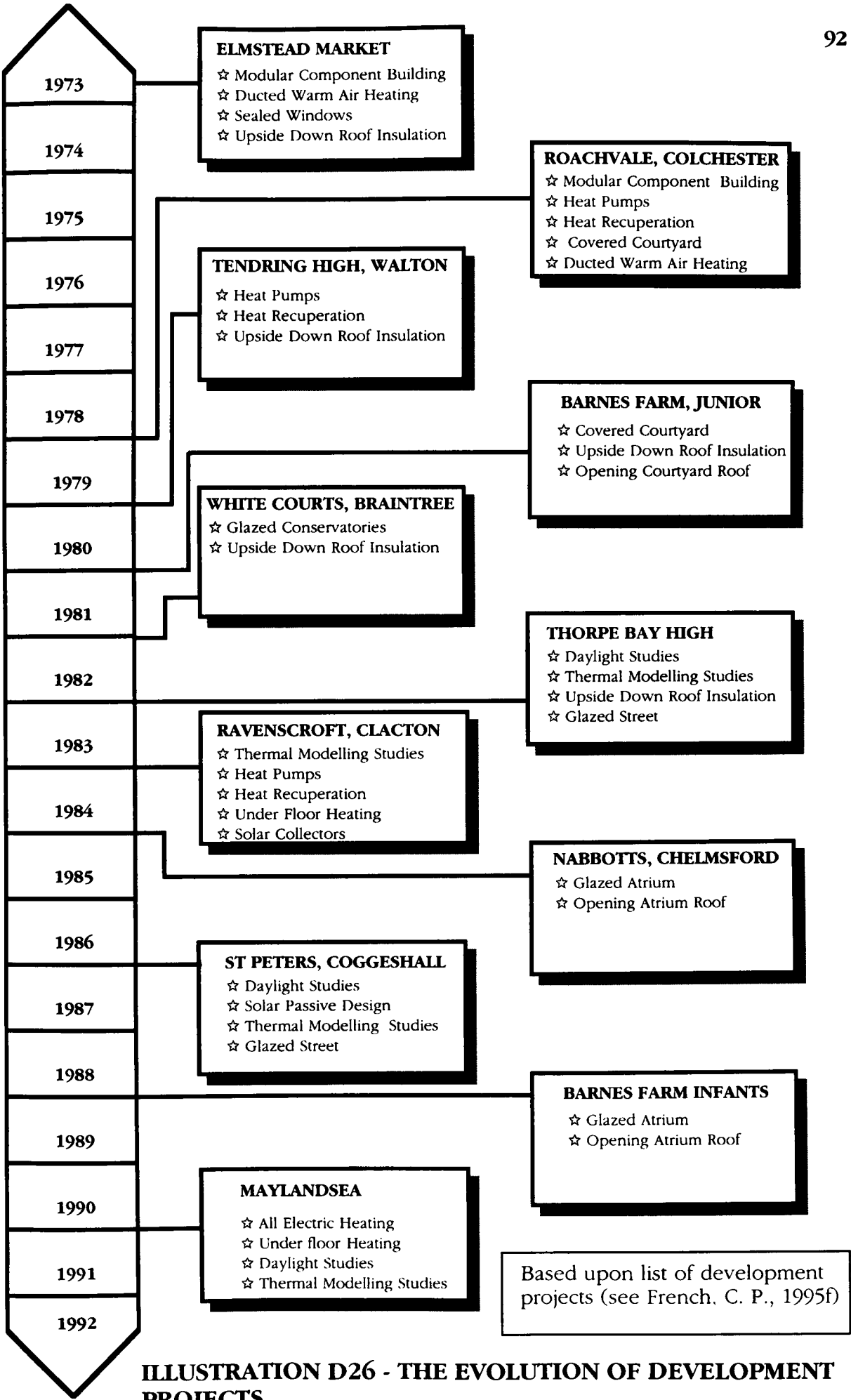


ILLUSTRATION D26 - THE EVOLUTION OF DEVELOPMENT PROJECTS.

aerated concrete roof planks. Environmental design was fairly basic with little account taken of orientation, and even the sealing of windows to control ventilation rates was negated by unlobbied exit doors from classbases direct to the open air. Insulation values of the walls and roof were better than the previous SEAC schools and windows were much smaller.

ROACH VALE PRIMARY SCHOOL, COLCHESTER (1978)

Several MCB primary schools followed Elmstead Market, developing the constructional system further, but Roach Vale Primary School was the next major development project. It had a more sophisticated plan with the teaching bases surrounding a central glazed courtyard or atrium, and the hall and admin housed in a separate pavilion, linked to the classbase block by a glazed entrance lobby. The re-entrant corners of the classbase block were also covered with glazed canopies to form outside teaching spaces. This was the first school to develop the concept of unheated secondary space for non-teaching activities, and to use a solar heated secondary space to preheat air for ventilation.

BARNES FARM JUNIOR SCHOOL, CHELMSFORD (1980)

The twin primary schools at Cherry Tree in Colchester and Barnes Farm in Chelmsford, although not classified as development projects, produced a more sophisticated central atrium with a glazed opening roof, which could be used for a variety of purposes due to its more generous size. In all other respects the low pressure hot water gas fired heating system and opening windows were traditional.

WHITECOURTS PRIMARY SCHOOL, BRAINTREE (1981)

Another series of similar MCB schools with repeated plans, is exemplified by Whitecourts School at Braintree and copied at Mistley Norman, and Great Leighs. It developed the concept of secondary space in a different direction, with the provision of external solar heated conservatories around the perimeter, although these proved less successful than the atrium. It also had a traditional gas fired heating system with radiators.

RAVENS CROFT PRIMARY SCHOOL, CLACTON (1983)

Ravenscroft Primary School was the next major development project at a primary school, with its forward thinking solar passive design and heat pumps using ground water from bore holes. The plan form was arranged to have all the classbases oriented towards the south east and west with thermo- siphoning solar collector walls, and service areas such as toilets and kitchens with reduced glazing on the northern elevations. The heat pumps were also used as the energy source for experimental underfloor heating and warm air heating with recuperators.

NABBOTTS JUNIOR SCHOOL, CHELMSFORD (1984)

Nabbotts Junior School, again not officially a development project, developed the atrium to the extreme, with a magnificent glazed unheated central secondary space, with an opening roof for summer months with sufficient space for many practical activities, indoor planters, seating and most of the circulation between class bases to take place. It has a traditional gas fired heating system with radiators fed from a central boiler house which it shares with the adjoining school.

ST. PETER'S C. OF E. PRIMARY SCHOOL, COGGESHALL (1986)

This was the next development project with a solar passive design, with all classbases facing south east or south west, circulation through a central street and a patent glazed roof to provide daylight into the deep plan form at the rear of class bases. It has a clever split level section which makes the best of the sloping site and a traditional heating system with radiators,

BARNES FARM INFANTS SCHOOL, CHELMSFORD (1988)

Barnes Farm Infants School was, again, not officially a development project, but has an atrium at its core which has been developed into an unheated glazed street for circulation, with an excellent performance due to its proportions and orientation.

MAYLANDSEA PRIMARY SCHOOL (1990)

This development project reverted to an earlier plan form with the classbases and hall in separate pavilions. The teaching pavilion has a central atrium in the form of a naturally lit but heated amenity area. The careful use of roof lighting and borrowed light from the atrium also produced very acceptable daylight levels, after extensive design studies using the artificial sky.

The lack of gas on the site led to the use of an experimental low pressure hot water heating system fed from off-peak electrically heated hot water storage tanks, which proved successful after some teething problems.

CHURCH LANGLEY PRIMARY SCHOOL, HARLOW (1993)

The most recent development project involving a primary school has been designed, but not yet constructed. It has a solar passive design with a southerly aspect for all teaching spaces, and a heavy-weight structure to act as fly wheel to moderate the extremes of climate. It also has a domestic scale heating system based upon twin classbase pavilions.

The department has also carried out a great deal of development work which does not involve the primary school sector including:-

TENDRING HIGH SCHOOL, WALTON (1979).

This development project involved the first use of air to water heat pumps housed in a glazed conservatory on the roof, with the solar space used to preheat fresh air for ventilation.

THORPE BAY HIGH SCHOOL, SOUTHEND (1982).

A glazed street or atrium was used to join several previously separate teaching blocks of an existing secondary school, increasing the insulation value of external walls by sheltering them from cooling winds, and providing a comfortable warm and dry route between different parts of the school.

ELM TREE CLOSE ELDERLY PERSONS HOME, FRINTON (1983).

This development project provided group living accommodation for the elderly in a number of bungalows linked together by a glazed street. Each bungalow had a different fuel source/boiler and heating system, providing the opportunity to monitor and compare energy consumption.

Users' views

Unfortunately, a study of selected primary schools visited during the research project demonstrates that the Development Projects, with their high environmental design and services input, were rated consistently below average by their users. (see illustration D3)

It is dangerous to read too much into this, however, as the relatively poor performance of many of the experimental heating and ventilation systems may have unduly influenced the users' view of their building. Clearly the users were less happy, however, with many aspects of the design of their school than other schools visited. (French, C. P., 1996g)

4.4 THE EDUCATION DEPARTMENT

The County Education Department has been the client for most primary schools in Essex and has played the biggest part in shaping their form and layout. Professional educationalists have had influence over the design of primary schools, for better or worse, in many guises, as civil servants at the Department for Education, or the Advisors, Education Officers and project officers in the County Education Department .

The Department of Education

The County Council has, along with most other Local Authorities, worked very closely with the Department of Education and Science over the last 25 years treating their Architects and Building Branch as the experts on primary school design.

Most Essex primary schools were also subject to fairly stringent Central Government legislation through The School Premises Regulations, which laid

down minimum standards. It was administered by the DES and supported by a whole series of guidance notes or building bulletins, which attempted to set examples and demonstrate good practice.

The Education and Architect's Department relied very heavily on these regulations and guidance notes as the basis of the primary school brief, as they stipulated certain minimum floor areas for teaching accommodation, ratios of toilets, areas of sites and hard playgrounds etc.

The DES also controlled the cost of primary schools up to 1985 through the approval of loan sanction and all schemes had to be submitted to the DES for approval before and after tenders were sought, to ensure the cost was acceptable and regulations met.

This procedure was also supplemented by regular visits from the DES territorial architect who saw all major schemes during the design stage, advised on their acceptability, and often influenced design trends by recalling recent DES development projects or policy initiatives.

The withdrawal of individual loan sanction controls by DES and substitution with a block approval system in 1985, very rapidly led to greater control of individual projects by the County Council's Education Officers who were able to decide on their own priorities, and institute a gradual change in quality and space standards for primary schools.

This was followed by a decrease in visits and the eventual demise of the DES territorial architect with a slowing up of the issue of guidance notes and building bulletins.

The School Premises Regulations have remained in force, however, with individual authorities self-certifying conformity. Education ministers have recently carried out a review of these basic regulations, however, and intend removing most of the current controls over school buildings.

Relationship with schools

The County Council has been run for many years as a centralist organisation, and this has been reflected in the relationship between individual schools and

the County Education Department based in the Area Offices and at County Hall.

The Area Offices employed most of the support staff to deal with personnel, property and finance issues, and the areas were run as beneficial dictatorships, with individual schools having very little control over their staff, budget or buildings. Unfortunately, this not only created a dependent culture, but also a sense of frustration amongst head teachers who wanted more control over their own destinies.

The introduction of the Local Management of Schools (LMS) and delegation of budgets has dramatically changed this relationship, and the Education Department find that many of the resources traditionally their responsibility are now controlled by individual schools. This reversal of role has changed attitudes within the Education Department, who now have to treat Headteachers as valued customers to be wooed rather than wayward spendthrifts wasting their resources.

Premises Unit

The County Education Department has had a strong Premises Unit (EPU) for the last 25 years, headed by an Education Officer reporting direct to the Deputy Chief Education Officer. This unit has the task of looking after the county's school premises from the client or users point of view, and has traditionally forecast the need for new schools and extensions, liaised with individual schools, prepared briefs, controlled the capital programme, ordered furniture and equipment and monitored work on site.

The Premises Unit has had a differing effect upon the design of primary schools, depending on the personality of the various education officers in charge. It is true to say, however, that most of the post holders have considered building designers to be profligate with a need to keep a firm hold of the purse strings. This has lead to many clashes between the Education and Architect's Departments over the quality of new primary schools, which is explained in greater detail in Chapter 11.

Project officers

The Education Department has traditionally appointed a project officer from the EPU for every major project. They represent the client within the design team, prepare briefs and obtain client approvals when necessary. These project officers used to be based at County Hall, but have been distributed around the County in the area offices since the introduction of LMS. They also have particular responsibility for a group of schools and now play a larger liaison role between schools and CEO.

The advisors

Essex County Council Education Department had a very strong advisory group and inspectorate in the mid 1970s, with a specialist adviser for primary school education. This adviser and his assistants visited all of the primary schools in Essex on a regular basis, explaining the latest County Council and Central Government policy on primary school education, and advised head teachers and their staff on the curriculum, methods of teaching, resources available and their built environment.

The Education Department relied heavily on these advisors who sat on the various inter-departmental working groups which produced the design guidelines and briefs. They were also members of the project team for individual new schools and extensions, along with the head teacher and education officers from the area office and County Hall.

Their advice was invaluable to the design team as they were able to draw on a wealth of experience of teaching practice countywide, to ensure that the proposals for new schools were in line with current practice, avoiding the particular foibles of individual head teachers.

Unfortunately, many of the advisors were aligned with progressive teaching methods and were seen to support open plan layouts, often against the advice of individual head teachers and began to be considered as suspect by some. They were also seen by some head teachers, keen to exercise the new found freedoms of LMS, as agents of the powerful central Education Department based at County Hall.

Their diminishing credibility and lack of influence, plus the privatisation of the inspectorate, led to a situation where no input from advisory staff has been made into individual projects for several years. They also made no contribution to the 1993 Essex Primary School Core Brief, and I think the lack of their moderating influence is evident in some of the more extreme statements contained within it.

4.5 THE TOWN PLANNERS

The County Council is a planning authority and deals with most planning applications for county development itself, including new and extensions to primary schools. These applications are made to the development control section within the County Planner's Department, who consult specialists such as conservation architects or highway engineers as appropriate, and the relevant District Council. They always try to resolve any conflicts before making a recommendation to the County Council's own Development Control Committee for a decision. Any extension to a listed building or development in a conservation area, has to be directed to the Secretary of State for the Environment for a decision after the consultation process.

Essex Design guide

The Essex Design Guide for Residential Areas was published by the County Planning Department in 1973, as an attempt by the County's town planners to encourage housing developers to get away from the boring layouts and house types of the 1960s estates, which despoiled so much of the Essex countryside.

The Design Guide introduced new highways standards, avoiding the sterilising effect of engineered solutions with their excessive sight lines and gentle curves which produced huge areas of wasted space between buildings. It also introduced the concept of the mews court where pedestrians and slow moving traffic could safely mix, allowing housing to be much closer together creating a domestic scale enclosure. (Essex County Council Planning Department, 1973)

The County Planner also encouraged the use of more vernacular building forms and materials, such as bay windows, gables, porches, brick, render, boarding and tiling.

The Design Guide proved to be very popular with developers, planners and the public, being published just as the general public were becoming more aware of their environment and demanding higher quality housing.

The planners realised, however, that many of the new housing schemes included a small neighbourhood shopping centre, and they attempted to apply the principles of the design guide to these larger scale commercial buildings. Unfortunately, the changing economics of the retail trade meant that many of these developments were the forerunner of today's out-of-town superstore, and the developer's answer to the planning pressures was to "dress-up" a steel framed warehouse structure with a Design Guide facade. This is best illustrated by the town centre of the County Council sponsored new town of South Woodham Ferrers and similar developments which have followed in every major town in Essex. (see illustration D27)

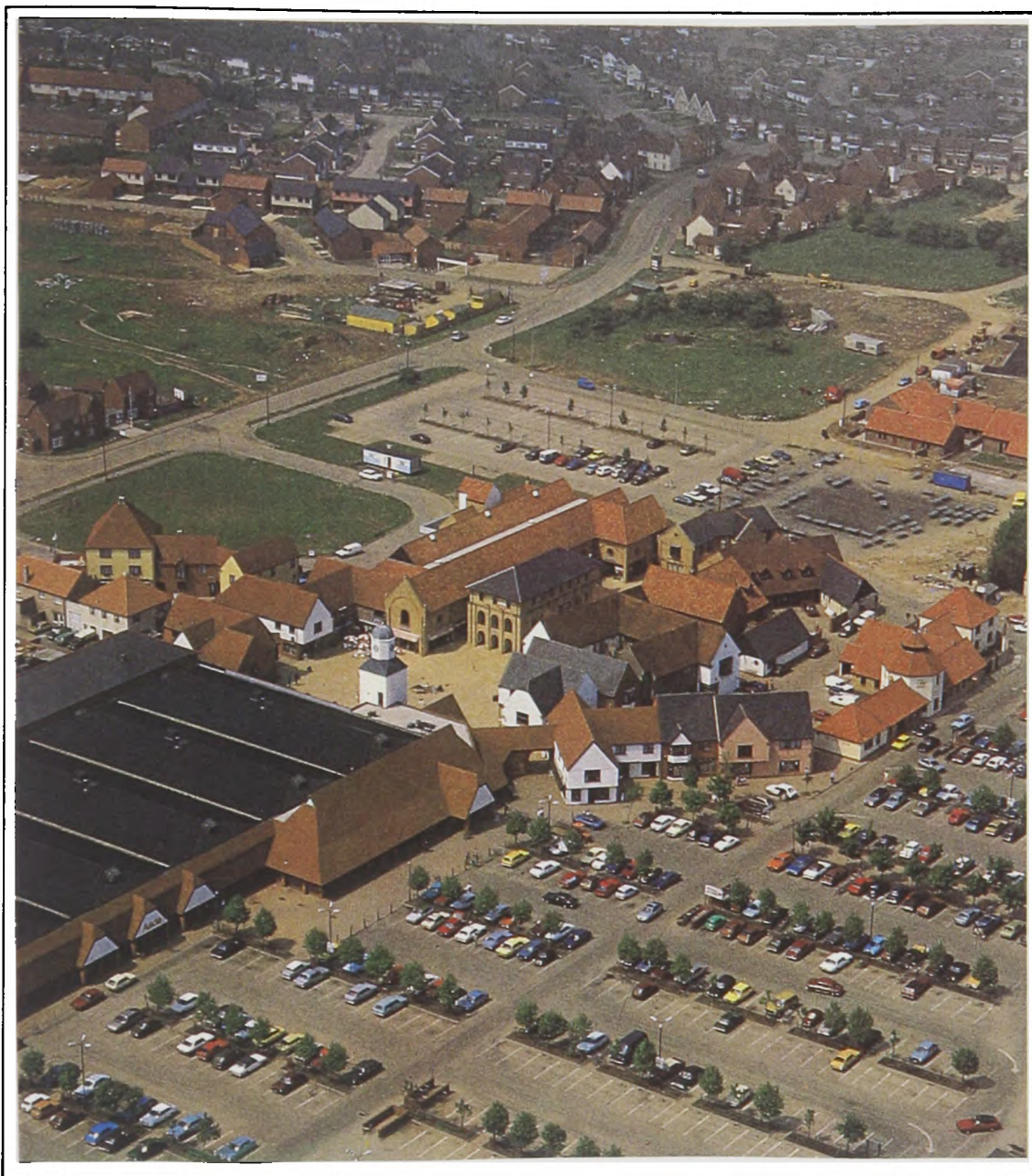
The design of all new primary schools built during the last 25 years has needed to satisfy the County Planner, who has consistently attempted to apply the principles of the Design Guide to these public buildings on the basis that most of them are set amongst Design Guide housing.

The County Architect has consistently opposed this policy claiming that schools have, and should have, a very much larger scale than housing because of the function of the building and its importance as a public building. Unfortunately, the planners have been prepared to ignore the Form Follows Function argument and have consistently promoted facadism of the worst kind.

This constant disagreement over style has produced a situation where the two departments have finally agreed to differ over design policy, and each project is now decided on its merits, with occasional battles over sensitive sites followed by an uneasy truce.

System building

The County Council's town planners with their love of vernacular architecture, and a desire to extend the principles of the Essex Design Guide to commercial and public buildings have understandably never been happy with the flat roof, concrete panelled MCB schools of the 1970s and 80s.



AERIAL VIEW OF TOWN CENTRE SHOWING THE VERNACULAR DEVELOPMENT AROUND A STEEL FRAMED SUPERSTORE WAREHOUSE.

Reproduced from South Woodham
Ferrers Promotional Brochure
(see ECC Estates Dept, 1982)

ILLUSTRATION D27 - SOUTH WOODHAM FERRERS TOWN CENTRE
Showing Planners 'Commercial' Design Guide.

The County Architect, Ralph Crowe's preoccupation with MCB development during the 1970s, and abrasive personality, led to many clashes with the County Planner, who thought the system inappropriate for certain locations where a more traditional building was needed to blend with the Essex vernacular in conservation areas and villages. The arguments between Chief Officers finally spilled over into the committee forum and were not resolved until Ralph Crowe tendered his resignation.

Unfortunately, this bad relationship between the two departments has continued into following decades despite efforts to improve the situation, and many of the county's planners are happy to criticise primary school design if it is not of a vernacular style, whatever the merits of its design.

Relocatables

Planners at both County and District level have expressed concern about the number of relocatable classrooms on primary school sites, particularly in relation to their insensitive design and siting, and have been pressing for many years for them to be replaced by permanent building.

All relocatable classrooms are treated as temporary structures and as such are given a maximum planning permission of 5 years. Although the Education Department present the need for relocatable classrooms as a temporary measure, many permissions are renewed after five years and very few are moved on to new sites. Some classrooms have, in fact, remained on one site for as long as 20 years.

Examination of the records since 1989 (Essex County Council, 1993) shows that the number of new relocatables has been steadily rising as follows:-

	TRANSFERRED	NEW UNITS	RENEWALS
1989/90	7	56	10
1990/91	12	31	3
1991/92	8	55	6
1992/93	5	42	1

The planners are also unhappy with the appearance of relocatable classrooms, and have repeatedly asked that they be designed with more appropriate

cladding and a pitched roof to help them blend with the permanent buildings on site (see illustration D 56). Unfortunately, these pitched roof relocatables are considerably more expensive than the flat roof variety and the Education Department has resisted their general introduction.

4.6 OTHER ORGANISATIONS

Several other County Council departments have played a major part in the development of Essex primary schools as periferal members of the design team, especially their internal and external design.

Grounds maintenance

The responsibility for the provision and maintenance of playing fields was entirely the responsibility of the Education Department until 1968, when the then County Architect, Ralph Crowe, successfully persuaded County Council members that it would be better if playing fields were provided as part of the new school building project. Up until this time the school had been built first and the playing fields and surrounding landscaping provided by the Education Department's Ground Maintenance Service later. This created a situation, however, where the playing fields were not available for at least 2 years after the school opened, and the surroundings left barren for the first year or two.

A Playing Fields Officer was recruited from the Turf Institute to carry out the design work, with an assistant transferred from the Education Department. After clearing the backlog they started to bring construction forward to coincide with the building contract. Unfortunately, the new working arrangement split the design from the maintenance of playing fields and created a considerable tension between the two parties with difficult communications, which are still evident today.

The new County Architect's landscape designers were keen to try new techniques and exciting design features, but the grounds maintenance staff often thought them impractical, difficult and expensive to maintain. The result of this lack of empathy and poor communications was that many of the innovative features, such as play mounds and ponds, were carted away or filled in within a relatively short period of time.

Schools have also experienced difficult relationships with grounds maintenance staff who have been faced with huge numbers of school grounds to maintain, and unable to give individual schools a personal service.

The introduction of LMS has encouraged schools to reappraise the maintenance service they receive from the grounds maintenance staff, who have also been subjected to compulsory competitive tendering. As a result, many schools are demanding higher quality maintenance of shrubs, trees and ground cover, in addition to the traditional grass cutting and marking of pitches, but grounds maintenance service has less manpower to deliver such a personal service.

County Supplies

The County Supplies Department was responsible for the design and purchasing of all school furniture until the arrival of a new County Architect in 1967. He persuaded the County Supplies Officer (CSO), that the Architect's Department should take responsibility for the design and supply of school furniture through the use of the Counties Furniture Group range (CFG), and the CSO's only draughtsman was transferred to the County Architect's new Furniture and Interior Design Group headed by a qualified furniture designer.

The Supplies Department resented this take-over of what they saw as their sphere of activity, and worked uneasily with the Architect's Department as prime mover developing CFG until its demise. They then formed more of a partnership with the County Architect's Department developing the "Essex Range" of furniture with the C.A's Furniture Group taking responsibility for design and CSO's Furniture Group taking responsibility for tendering, ordering and delivery. This arrangement appeared to work well apart from one or two misunderstandings resulting from a lack of clarity over "who did what".

This partnership has subtly changed, however, over the past five years with the commercialisation of the Supplies Department, and the launch of the "Springfield Range" of furniture, with the County Architect's designers slowly withdrawing from the partnership and being replaced by the manufacturers as the second partner.

During the 1970s and the early 1980s the supply of furniture and equipment to primary schools in Essex was very autocratic, and closely controlled centrally from the Education Department.

The Furniture and Equipment Section at County Hall had a strictly limited budget for each project, with a standard list of equipment for each size school, irrespective of what the Headteacher or staff really wanted. There are several anecdotal stories of expensive pieces of furniture and equipment, in pristine condition, discovered locked away in a cupboard by a new head teacher several years after a school opened, because it was part of the standard kit, but staff did not know what it was for or had no use for it.

The delegation of funds to individual schools through the L.M.S. scheme gave schools a taste of independence and, although funds for capital schemes are still held centrally, the schools soon demanded a say in what furniture and equipment was supplied. The Education Department has now bowed to this inevitable pressure, and individual schools are allowed to choose their own furniture and equipment within the constraints of a fixed budget.

It is also interesting to note that, although not now the responsibility of the County Council, the Grant Maintained primary schools have also returned to use the services of the County Supplies Department after an initial period where they sampled the market, and found that the "Essex Range" of furniture is very good value for money.

4.7 CONCLUSIONS

This examination of the role of members of the design team has revealed a picture of change including :-

- An Architect's Department which has attempted to bring a multi-disciplinary approach to the design of primary schools, but has been frustrated by the conservative nature of many construction professionals and changes in its' structure and size which has brought about a diminution in influence over primary school design.
- A reduction in the number of development projects within the Architect's Department and amount of feedback aimed at improving the final product.

- A change in the size and structure of the Education Department and its influence over individual schools.
- Continuing tensions between the County and District Town Planners and Architect's and Education Departments over the form of new primary schools and the use of temporary structures.
- The commercialisation of departments supplying furniture and grounds maintenance reducing team work, but introducing a more direct relationship with individual schools.

The past tension between the various personalities and organisations involved in the design of Essex primary schools has, in some ways, created a healthy debate about the nature of primary school design. It has also, however, prevented the design team working together to resolve many of the pressures besetting the modern primary school.

The current period of change in Local Government, loss of experienced in-house design capability and greater use of external consultants and contractors is bound to continue these uncertainties and lack of direction.

CHAPTER 5

PRIMARY SCHOOL PLANNING

5.1 INTRODUCTION

This Chapter will examine Essex primary school planning and the relationships between the component parts of their accommodation. It will not consider the detail layout or relationships within individual spaces as these are dealt with in Chapter 12.

The plans of 147 primary schools built and extended since 1973 will also be analysed to establish any patterns within their provision, and what lessons can be learnt from the precedent they set.

5.2 EDUCATIONAL FACTORS

In many ways the planning of primary schools since the last war has changed dramatically in response to educational and architectural style, from the post-war cellular plans, through the amorphous open plans of the 1970s, to the recent return to more cellular plans. The basic educational needs of the school have remained remarkably constant, however, and are still just as valid today for use by future designers.

School life - public versus private

The primary school designer must take account of the different levels of operation within the school and reflect this in its planning,

A primary school has component parts with different functions rather like a village, with the individual classrooms resembling family houses, and the hall, amenity room, library and group rooms similar to the village church, shop and pub. The life of the school operates at many different levels within its accommodation similar to the village, with some individual or small group activities, like private study and project work, best carried out in the protected environment of the family home and other, large group activities, in the more exposed public arena.

Expansion and change

Primary schools have to be able to grow and change throughout their life to accommodate increasing or decreasing numbers overall. Teaching methods and

the curriculum will also change from time to time and the school accommodation must be able to adapt accordingly.

In reality this means that the school layout must present opportunities for extension, by providing node points where additional teaching accommodation can be successfully linked into the main circulation hierarchy without compromising existing classbases.

Central administration and ancillary accommodation must also be planned to allow for expansion in parallel with teaching spaces.

Flexibility - building versus pupils

Chapter 3 has explained the vital importance of providing a primary school layout which has sufficient flexibility to accommodate the inevitable change endemic in the educational system. This change can be provided by, flexibility within the building structure, the way in which spaces are used, or by a combination of both.

One of the main advantages claimed by designers of open plan schools was flexibility to arrange and rearrange classbases and specialist facilities to suit different teaching methods, class sizes and groupings. In reality, much of this flexibility has proved illusory, as teaching staff neither had the desire or time to rearrange their school on a regular basis. (French, C. P., 1994a)

Most teachers have found it much easier to cope with changing curriculum and class sizes by moving groups around the school to rooms appropriate to their size and have looked for variety in the size and character of spaces throughout the school. Conversely, other teachers have not wanted to split their classes into smaller groups outside the classroom, and have attempted to satisfy demand by subdividing their own classrooms to provide a variety of spaces. (French, C. P., 1994b)

Relationships

The relationship between various spaces and activities in any primary school is crucial to the success of the teaching accommodation at all levels. It is equally true of the different parts of the same room, such as quiet study area and

practical bay, as the different parts of the entire school, such as the hall, classbases and administration suite.

It is important for the school designer to understand the hierarchy of spaces in a school and those activities which need to be next to each other, and those which can afford to be geographically distant. This will depend wholly on the frequency of connection, i.e. the distance between the classbase and its outdoor coat store is crucial as pupils will pass between them at least six times every day, whereas the relationship between the hall and the amenity room which might be used as a green room for performances twice a year, is less important. (see illustration D28)

5.3 GENERIC TYPES

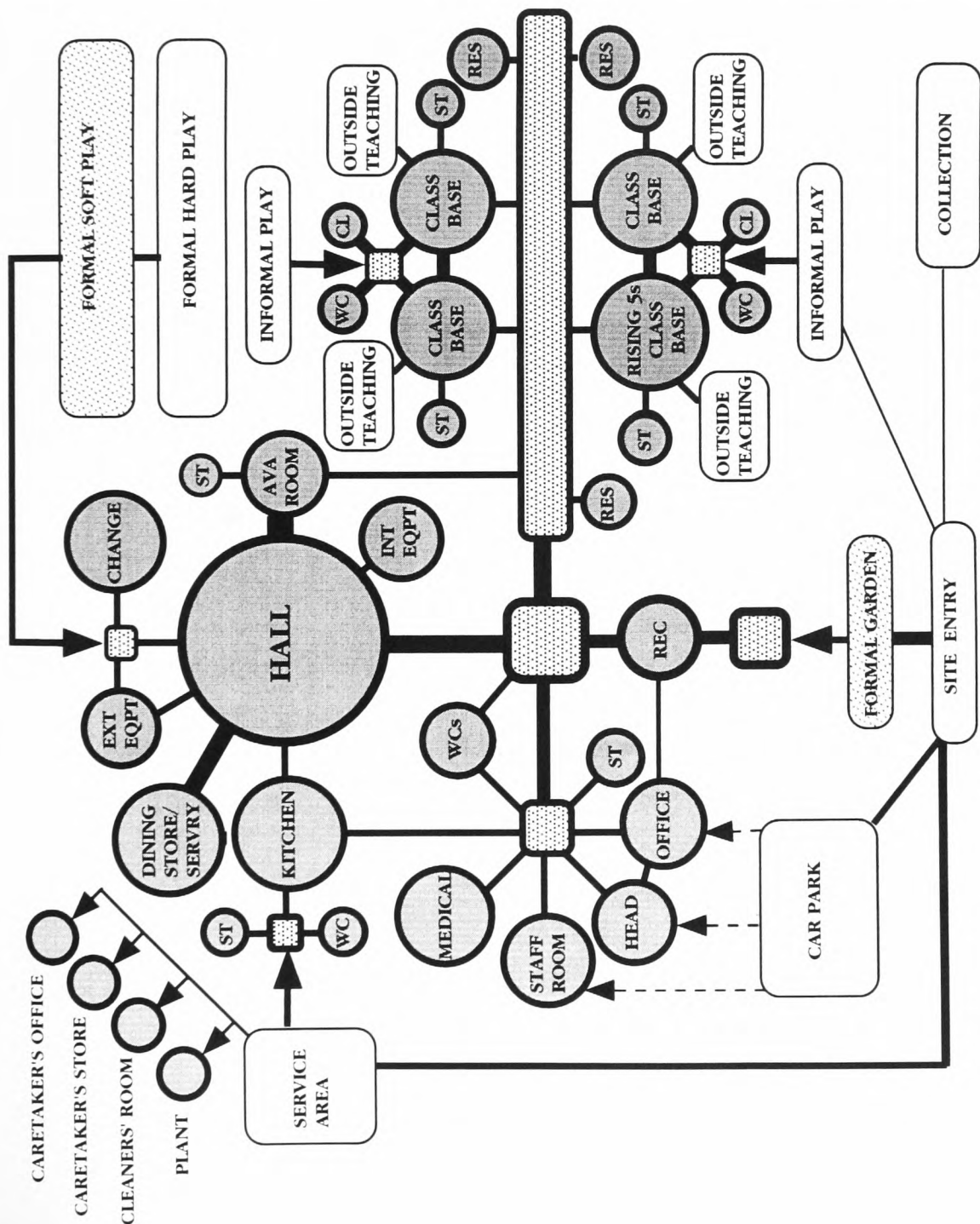
A study of new primary school designs since 1973 shows that they have followed certain basic planning principles, in that they have been mainly open plan buildings based upon a paired teaching base module with a limited number of generic plans and relationships between the teaching bases, hall, practical areas, group rooms, coat storage and toilet areas.

Analysis of the 147 new schools and major extensions shows that some generic plans were popular at certain times and a clear evolutionary pattern can be traced throughout the period, amply demonstrating the advantages and disadvantages of different arrangements. (see illustration D29 & D30)

Deep plan

The deep plan school dominated the early part of the period with 17 schools built in this style between 1973 and 1974. Usually the hall is in the centre of the plan, with the teaching bases and other accommodation evenly spread around the perimeter.

The only form of natural daylight and ventilation is from perimeter windows or clerestory windows serving the higher volume of the hall, the rear of classbases around the hall needing to be artificially lit and ventilated. Many of these schools had free-standing or moveable partitions to enable the area and shape of teaching bases to be adjusted to suit changing needs.



KEY

Briefed Internal Spaces

Internal Circulation

Hard External Spaces

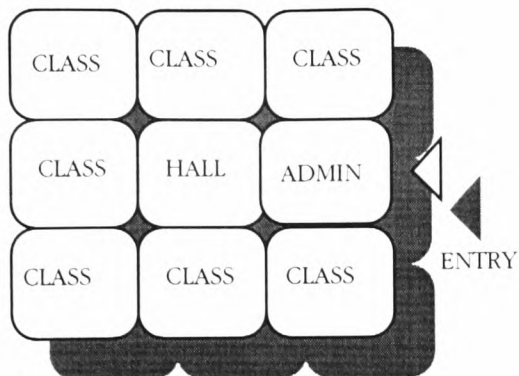
Soft External Spaces

Desire Line

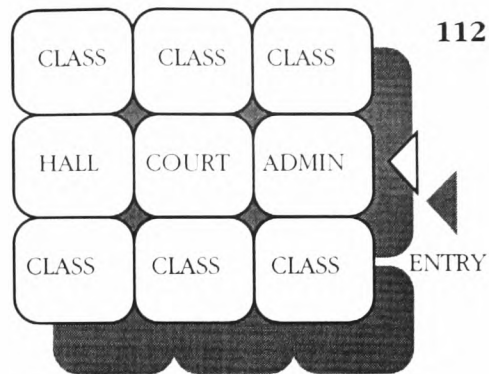
Relationship diagram from the current primary school model brief showing the ideal relationship between the main elements of accommodation

Reproduced from the Essex primary school brief (see ECC Prop Services Dept, 1994)

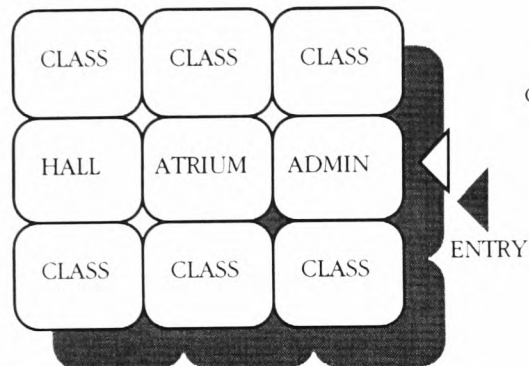
ILLUSTRATION D28 - RELATIONSHIP DIAGRAM



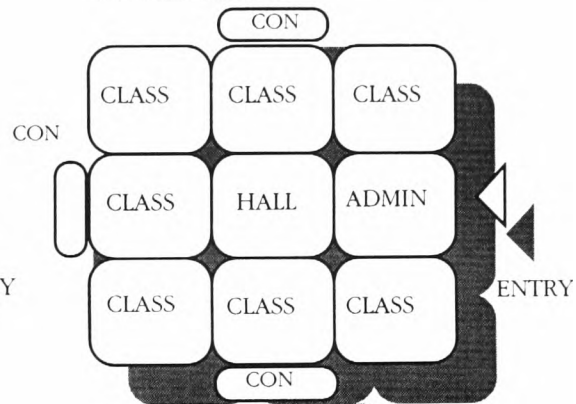
DEEP



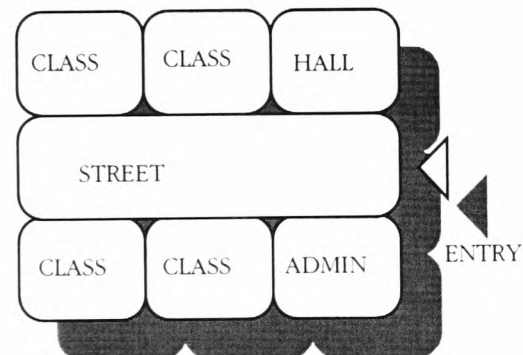
COURTYARD



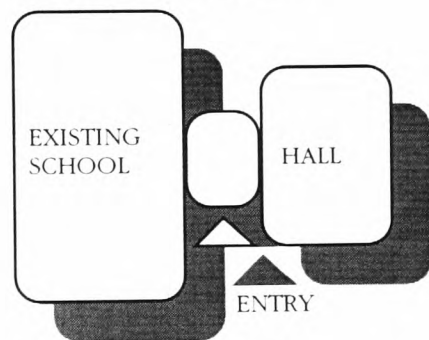
ATRIUM



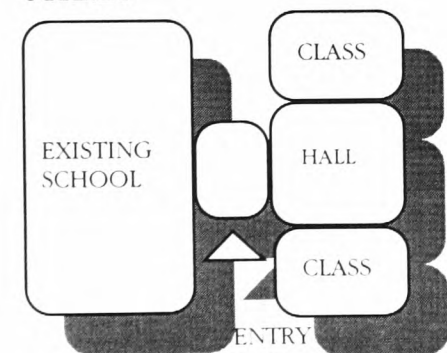
CONSERVATORIES



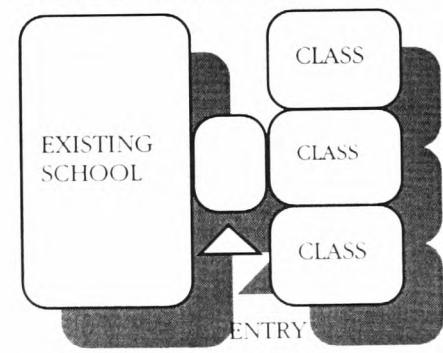
STREET



HALL EXTENSION



HALL & CLASS BASE EXTENSION



CLASS BASE EXTENSION

ILLUSTRATION D29 - GENERIC PLANS
Showing the most frequently used plan
arrangements in Essex primary
schools since 1973

Based on an analysis of
 147 primary school plans
 (see French, C. P., 1995d)

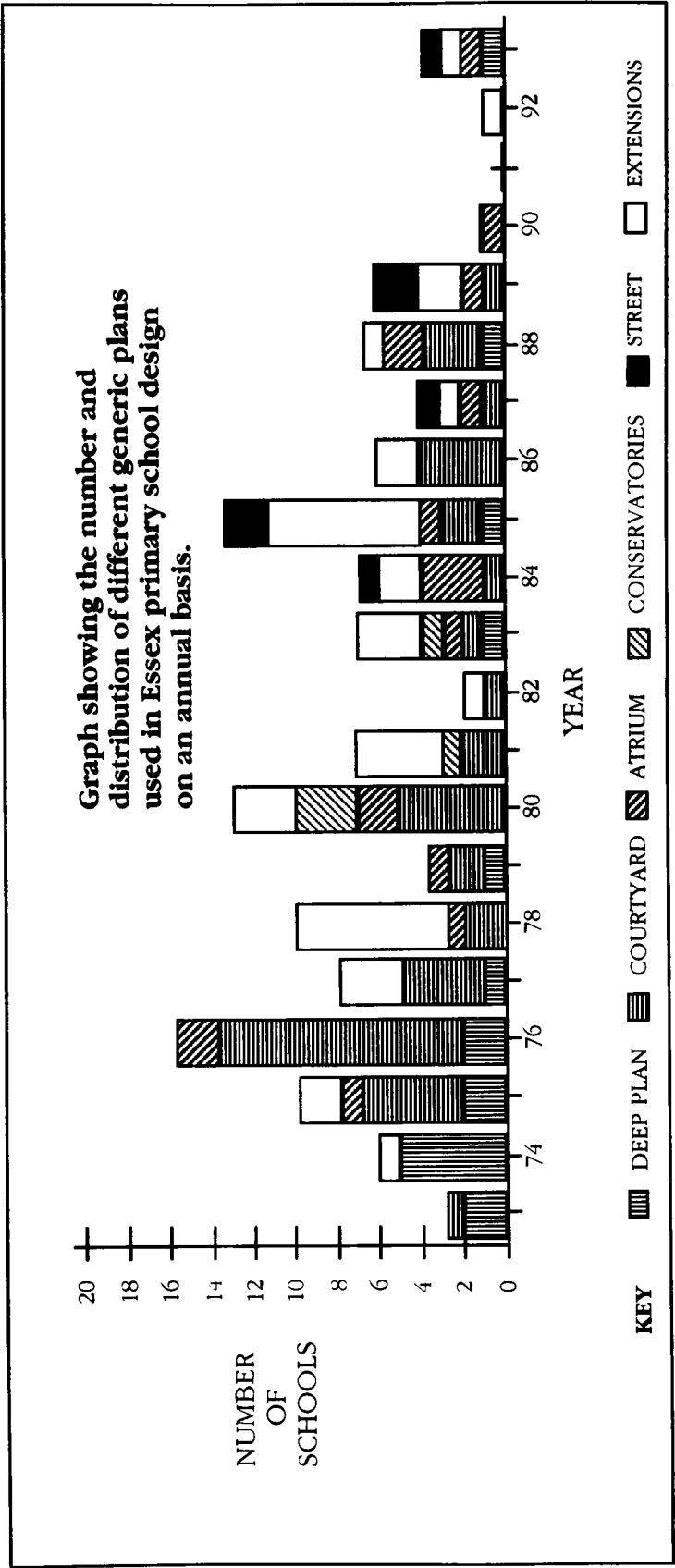


ILLUSTRATION D30 - FREQUENCY OF GENERIC PLANS USED IN ESSEX PRIMARY SCHOOLS

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

The main advantages of this type of plan were the direct relationship between activities and complete flexibility to rearrange teaching accommodation at will. The main disadvantages were the lack of privacy for quieter activities, and poor natural lighting and ventilation.

Courtyard

The courtyard plan has been the most dominant plan form over the last 25 years, with 47 schools built in this format with the majority built between 1975 and 1978. The courtyard plan consisted of a regular square or oblong shape, with either one large or two small open courtyards in the centre to allow natural light and ventilation into the deepest part of the open plan school. The courtyards were often paved for use as outside teaching areas, or landscaped to provide a visual release from the deep plan spaces.

The main advantage of this option was the improved environment to the deep plan, and direct access to the sheltered courtyard. The main disadvantage was the increased perimeter to the building, if the courtyard was to be large enough to be useful, which increased costs and heat loss.

Atrium

The covered courtyard or atrium plan was a natural progression from the open courtyard, when architects under pressure to reduce the cost and area of primary schools, produced designs with low cost glazed roofs over courtyards, allowing them to be used as unheated secondary space for circulation and/or practical activities. About 18 atria plans were produced throughout the period between 1975 and 1993.

The main advantages of this plan was the creation of a cheap central space which could be used for a large part of the year for practical activities, circulation, and to light and ventilate the deep plan. Their only real disadvantage was the lack of insulation and heating which precluded their use at the height of summer and winter due to extremes of heat and cold.

Conservatory

The conservatory plan was an attempt to provide similar cheap secondary space to the atrium, but in the form of conservatories located around the perimeter.

Most of the schools which adopted this solution had a centrally positioned hall without space for a central courtyard or atrium. Only 5 of these plans were built between 1980 and 1983 and they generally proved to be unpopular.

Their main advantage was that they could be added to the main structure of the school in a cheap lightweight construction. They had severe disadvantages, however, as perimeter accommodation was difficult to access, they over and under-heated in summer and winter, and occupied valuable lengths of the schools perimeter needed to light and ventilate classbases.

The street

The street or spine plan form is a further development of the atrium or covered courtyard option, where the central glazed roof space is stretched into an elongated circulation spine giving access to all teaching bases and ancillary spaces, but of sufficiently generous proportions to house some practical or specialist activities. The spine is also in permanent construction of the same quality as the rest of the building, being heated in winter and shaded in summer to give good environmental conditions.

This plan form is a fairly recent development with 7 schools built in this style between 1984 and 1993.

The main advantage of this option is the clear and direct circulation to all major activity spaces, with opportunities for shared space off the street. The only major disadvantage is the possible lack of aural privacy between spaces.

Extensions to older schools

The County Council has a large number of primary schools built before 1973, many of them late Victorian or Edwardian Board Schools in rural locations or within heavily populated urban areas. A large number of these schools were deficient in accommodation in that many had:-

- Several of their classbases in temporary timber framed accommodation.
- No hall.
- Inadequate dining facilities.

- Outside toilet facilities.
- Inadequate staff and office accommodation.

The Education Department has attempted to make improvements to these schools during the past 25 years, as well as providing new accommodation to meet the demands of a growing school population.

Much of this work has been in the form of small extensions to existing schools in the form of a new block containing either a new hall with one or two classbases, a new hall on its own, or separate classbases. There were 38 such projects built between 1973 and 1993 evenly spread throughout the period.

5.4 THE CLASSBASE

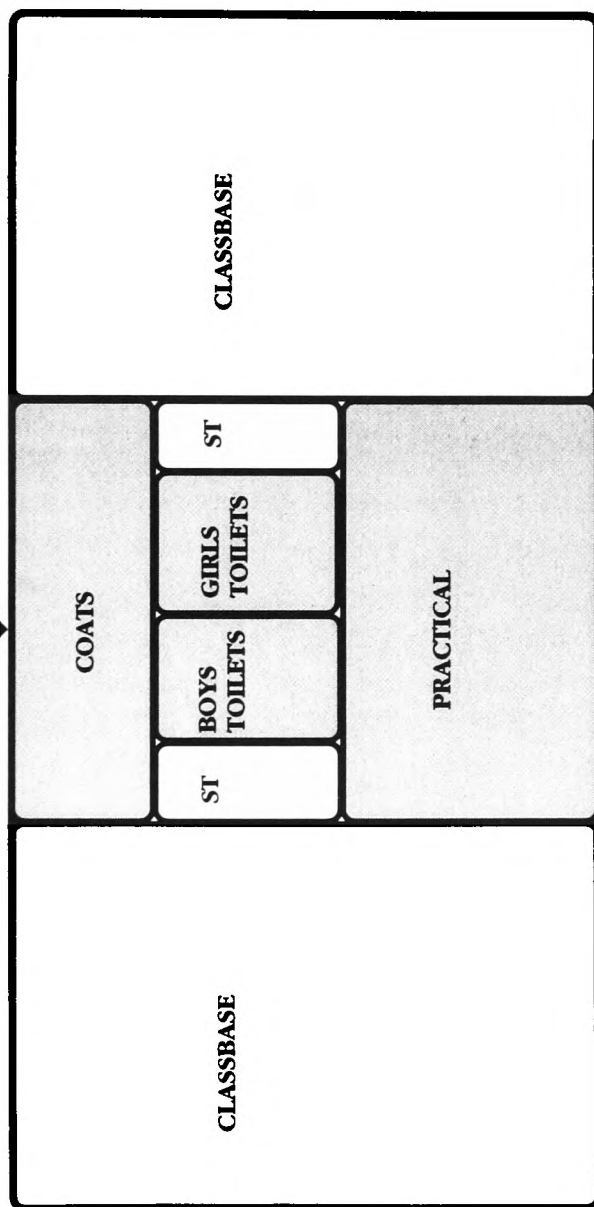
Generally Essex primary schools have placed great emphasis on the individual classbase as the centre of learning throughout the study period, with most teaching taking place between the class teacher and a group of 30 plus pupils.

The current primary school brief mentions, however, that space, fixtures and furniture in the classbase should be flexible, and the building planned to allow for co-operative work, without compromising spaces for quiet enclosed activities. It suggests that practical areas should be linked and shared by pairs of classbases. It also mentions that spaces should be easy to supervise without inhibiting the movement of children wishing to observe, investigate and research. The suggestion of glazed panels between classbases is a useful example of how this might be done, whilst maintaining aural privacy.(Essex County Council, Property Services and Education Departments, 1994.)

Paired base

Essex has not really developed the concept of team teaching introduced into primary schools in the late 1960s to any extent, other than to pair teaching bases with some sharing of resources such as practical areas and quiet or group rooms. (see illustration D31)

PUPILS ENTRANCE FROM PLAYGROUND



This diagram shows the most popular arrangement of paired classbases sharing a common entrance from the playground, coat storage, toilets and practical area.

ILLUSTRATION D31 - TYPICAL ESSEX PAIRED CLASSBASE
Showing the grouping of facilities shared by two class bases

Based on an investigative essay
(see French, C. P., 1995h)

The very early schools, with their clear spans and movable partitions foresaw the divisions between classbases being removed as team teaching grew, but this has not happened and divisions between classbases became more permanent in later schools.

Other relationships between class bases

Some of the later schools with twin classbases also had further grouping opportunities by providing links between adjacent pairs of bases through sliding doors/screens provided in a permanent partition. This allows teachers to supervise two, three or four classbases if the need arises, and allows year groupings to flow between them when inevitably numbers will not fit. (see illustration D32)

Shared specialist facilities

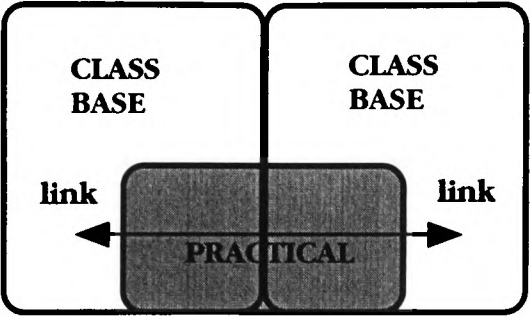
Many schools built in the early 1980s had classbases divided into different size spaces, each with a different character for quiet activities, such as reading and story time, or noisier practical areas for messy activities, such as glueing, painting and modelling. Separate specialist areas were also provided at this time for shared use by the whole school, including cookery, pottery and technology, but as mentioned in earlier chapter, these were not popular due to supervision problems. A more recent trend, therefore, has been to enlarge the classbase and bring all these activities into the classbase on mobile workstations or trolleys supervised by the class teacher.

Shared cloakrooms

The pairing of classbases has also been extended to ancillary accommodation such as toilets and coat storage, with two classes sharing one outside pupil entrance with access to common toilets and coat stores. This is discussed in some detail later in this chapter.

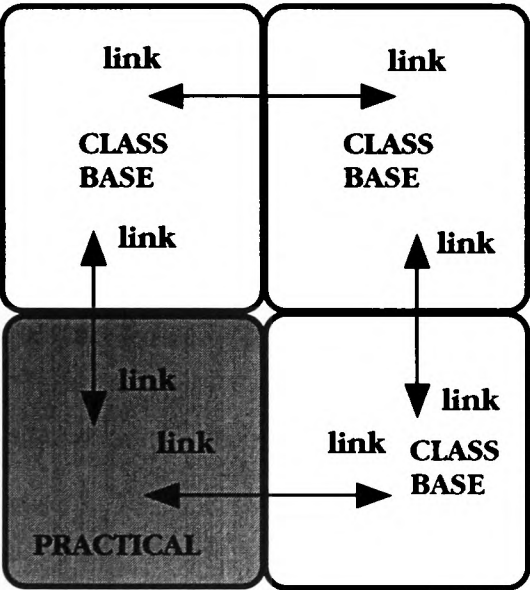
Users views

Teaching staff questioned about the relationship between classbases, generally thought it to be good, but those schools with a large number of relocatable classrooms thought they were at a severe disadvantage compared to classbases in the main school, often feeling isolated with poor access to central facilities such as the hall, AVA room and library. (French, C. P., 1994m)



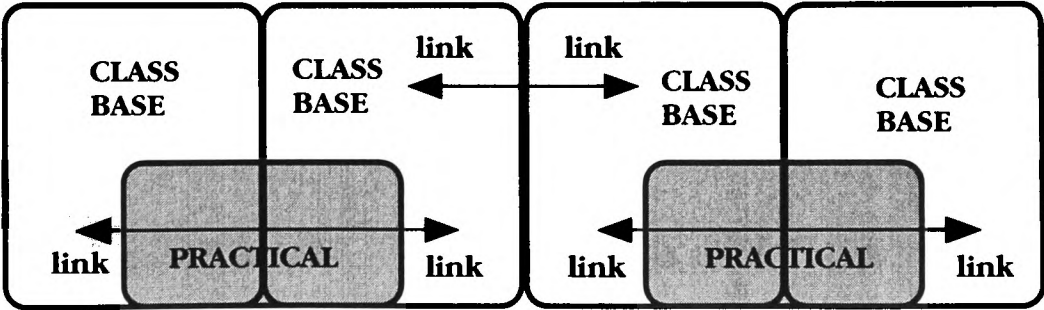
TWINNED

This arrangement has been used extensively throughout Essex since 1973 with varying degrees of separation between class bases. There are many examples of this classic arrangement, the most recent being Shelley primary school in Ongar.



TRIPLED

This arrangement has been used very infrequently usually to turn a corner.. It has proved unpopular amongst teachers who dislike the disruption caused by pupils passing through teaching space. The best example is St Peter's Coggeshall.



QUADRUPLED

This arrangement was used in about 6 schools mainly in the mid 1980's using a sliding door between the two pairs of bases. A good example of this arrangement is Nabbotts Junior school in Chelmsford.

ILLUSTRATION D32 - CLASS BASE LINKS
Showing relationships between Essex class bases

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

GREENWICH LIBRARY

5.5 PRACTICAL AREAS

Practical areas for wet or messy activities in Essex primary schools are traditionally closely associated with the classbase.

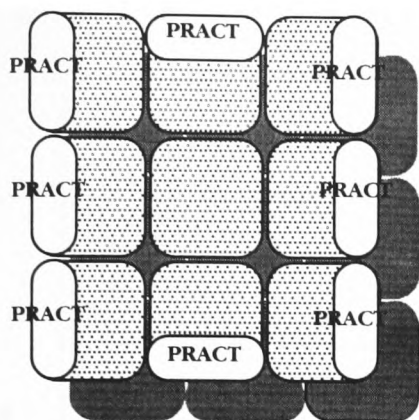
Examination of the 147 primary school plans built in the last 25 years reveals that there are only three basic positions for these practical areas (See illustration D33 & D34) :-

Central

This is where all the practical spaces are arranged around the core of the building, with the quieter study areas positioned around the perimeter. Often the practical areas obtain their natural daylight and ventilation from an adjacent open courtyard, glazed atrium or glazed street. The principal advantages of this arrangement are that practical activities can overflow into the court, atrium or street, the practical areas can form a circulation link between bases, and servicing is very economic. The main disadvantages are that the core of the building can become very noisy and have a messy appearance. This option has proved to be the most popular arrangement for practical areas, however, with 53 schools adopting this solution.

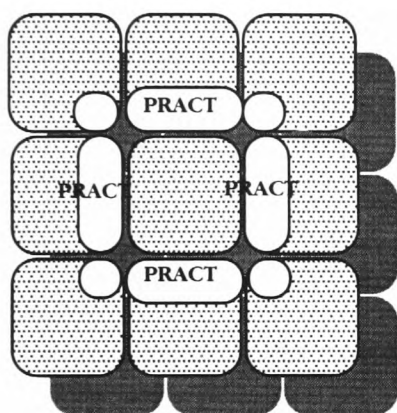
Perimeter

This is where all the practical areas are positioned against the outside walls of the building, with quieter areas grouped around the core. The main advantages of this arrangement are that practical activities can overflow into outside teaching areas during fine weather, and have access to good natural daylight and ventilation. The principal disadvantages are the greater cost of dispersed services to sinks etc., the possible obstruction of access to the outside for facilities such as toilets and coat storage, and little opportunity for links between practical areas, particularly at corners. This configuration of practical areas has been less popular with designers and only 22 schools have adopted such an arrangement throughout the study period.



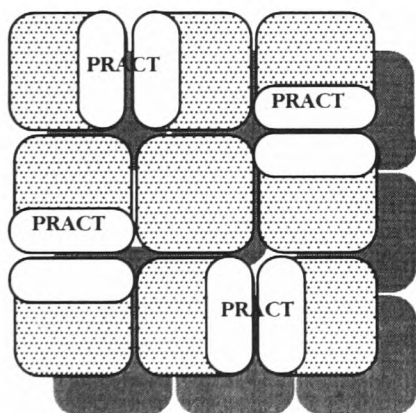
PERIMETER

This arrangement has been less popular due to the dispersed services and blocking of valuable perimeter wall.



CENTRAL

This is the most popular arrangement due to the easy links between class bases and opportunity for overflow into atrium or courtyard.



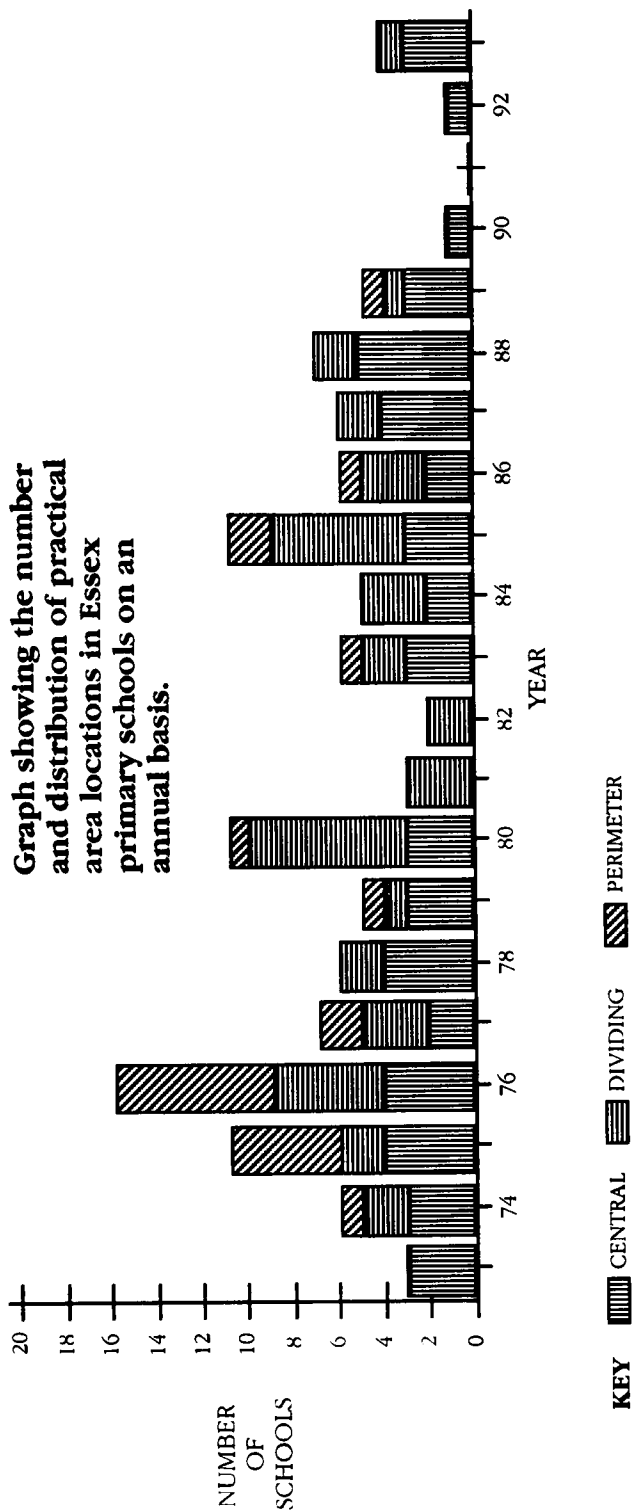
DIVIDING

This arrangement has also proved very popular with opportunities for sharing between bases and efficient concentration of services.

Based on an analysis of
147 primary school plans
(see French, C. P., 1995d)

ILLUSTRATION D33 - POSITION OF PRACTICAL AREAS
Showing the limited positions of practical areas in Essex primary schools since 1973.

Graph showing the number and distribution of practical area locations in Essex primary schools on an annual basis.



Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

ILLUSTRATION D34 - FREQUENCY OF PRACTICAL AREA LOCATION

Dividing

This is the use of one shared or two back-to-back practical areas placed between pairs of classbases being used to either divide or link the classbases. The main advantages are the efficient use of services, grouping of messy activities into an area which can be suitably finished with appropriate wall and floor coverings, and opportunities for sharing of activities and resources between paired bases. The main disadvantage is that such facilities can prove to be a permanent obstruction to any subsequent reorganisation of teaching accommodation. This arrangement has proved to be very popular, however, with 47 schools adopting this type of plan over the last 25 years.

5.6 GROUP OR QUIET ROOMS

It was realised in the earliest open plan schools that the lively aural and visual environment created would not be appropriate for all teaching situations, and some quieter withdrawal spaces would be needed where small groups of children could withdraw from the general melee of the classbase for quiet study and one-to-one or small group tuition.

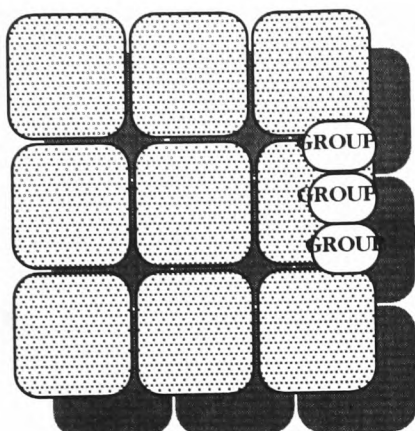
These were created in Essex primary schools by the provision of small group rooms, with either one shared between a pair of bases or by several rooms shared by the whole school.

These quiet or group rooms proved to be very useful for a variety of purposes, including small group project work and individual study. Unfortunately, however, school staffing levels created supervision problems if the quiet rooms were too remote from classbases, and/or did not have good vision into the room from surrounding areas.

An examination of the 147 primary school plans built during the last 25 years shows that these group rooms have traditionally been positioned in one of two situations (See illustration D35 & D36) :-

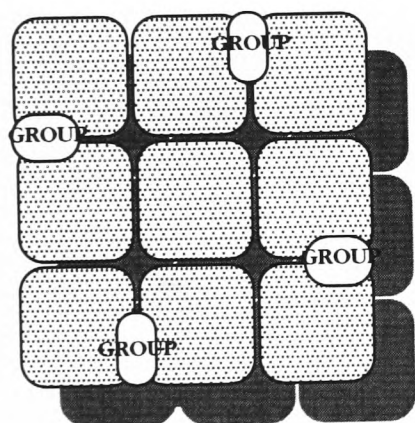
Dividing

This is where the group room is positioned on an outside wall between, and shared, by adjoining classbases. The main advantages are that the space is immediately available to the classbases, is easily supervised by the class teacher



SEPARATE

This arrangement provides greater access to group rooms but can create supervision problems.



DIVIDING

This was the most popular location with group rooms shared between a pair of bases.

Based on an analysis of
147 primary school plans
(see French, C. P., 1995d)

ILLUSTRATION D35 - LOCATION OF GROUP/QUIET ROOMS
Showing the limited number of locations for group rooms in Essex
primary schools since 1973

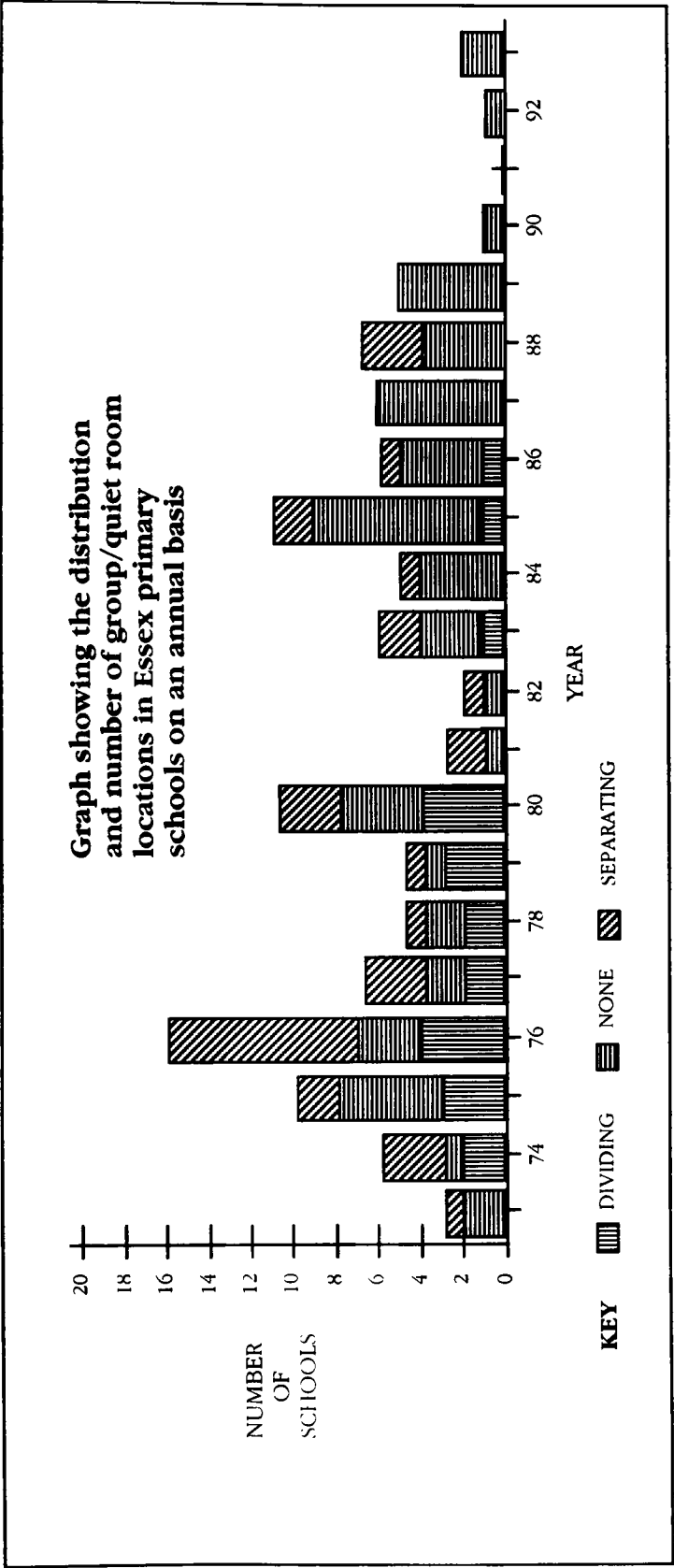


ILLUSTRATION D36 - FREQUENCY OF GROUP/QUIET ROOM LOCATION

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

and can have its own window for natural light and ventilation. The principal disadvantages are that they are likely to have poor sound insulation from the surrounding activities and can form an immovable barrier to future reorganisation of teaching space. This arrangement, however, has proved to be a reasonably popular solution with 23 schools adopting this format.

Separate

This is where the group rooms are situated together, either against an outside wall, opening onto an atrium or street, or possibly on a mezzanine or at first floor level. The main advantages of this arrangement are that sound insulation from noisy activities can be achieved with greater ease, and all classbases have equal access to all group rooms, giving better utilisation and timetabling of space. The principal disadvantages are that group rooms are remote from classbases and supervision can be difficult. The arrangement has proved marginally more popular with 35 schools adopting this type of plan.

No group rooms

It should be noted that many primary schools particularly those built after 1982, were not provided with group rooms, presumably as a result of more compartmentalised planning and a desire to put the space saved back into the classbase. As many as 60 of the schools studied did not have small group rooms of any type.

Demise of the Group room

About half of the 18 schools visited had small quiet or group rooms subdividing classbases, but these were thought to reduce flexibility and lock-up valuable space. Some schools had removed walls to allow the classbase to "flow" into the quiet room space and improve supervision. Other schools had converted them into specialist areas for science, libraries, cooking, storage or deputy head bases. Very few were still used for their original purpose of small group work.

5.7 HALL

The Hall is probably the most highly timetabled central resource within the primary school, being used for events where the whole school are assembled, and for class specific functions.

It is important, therefore, that it is located in such a position that all groups have equal access to it. The hall can also be a valuable source of income to the school, in the form of out-of-hours letting and must also be accessible to visitors out-of-hours.

A study of primary school plans reveals that there are a limited number of positions for the hall with some more popular than others (see illustrations D37 & D38):-

Perimeter

This arrangement involves placing the hall against the outside wall, with the classbases and other accommodation dispersed around the remaining perimeter.

The main advantages of this siting is the good access to outside, ample natural daylight and ventilation, views of the outside and reasonable sound insulation from surrounding classbases, etc.

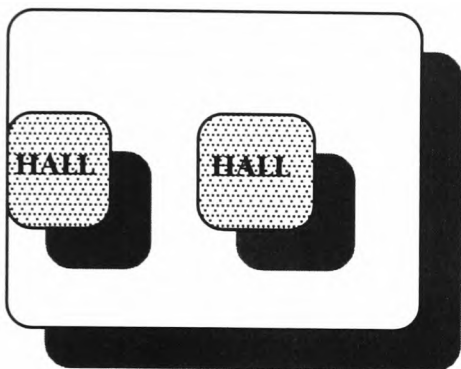
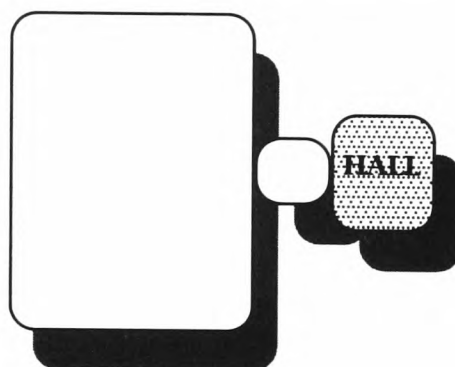
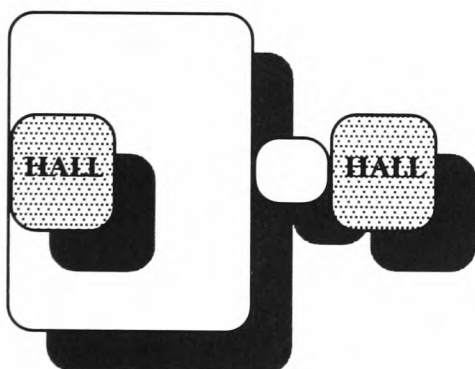
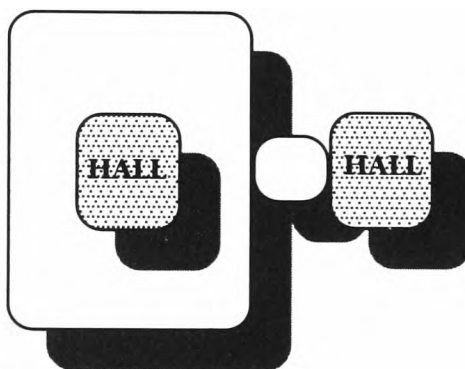
Its main disadvantages are poor access from certain teaching bases furthest away from the hall, and possible difficulty in the architectural articulation of a taller volume at the perimeter of the plan.

This arrangement has proved to be very popular, however, with 49 schools adopting this format for their hall.

Central

This is where the hall is located centrally in the core of the plan, with classbases and other accommodation arranged around the perimeter on all sides.

The main advantages are easy access to the hall from all classbases and an economic building form, particularly when using certain building systems.

**SINGLE - PERIMETER****SINGLE - CENTRAL****TWIN - CENTRAL & PERIMETER****SINGLE - SEPARATE****TWIN - PERIMETER & SEPARATE****TWIN - CENTRAL & SEPARATE**

Based on an analysis of
147 primary school plans
(see French, C. P., 1995d)

ILLUSTRATION D37 - LOCATION OF HALL
Showing the limited number of locations for
the hall in Essex primary schools since 1973

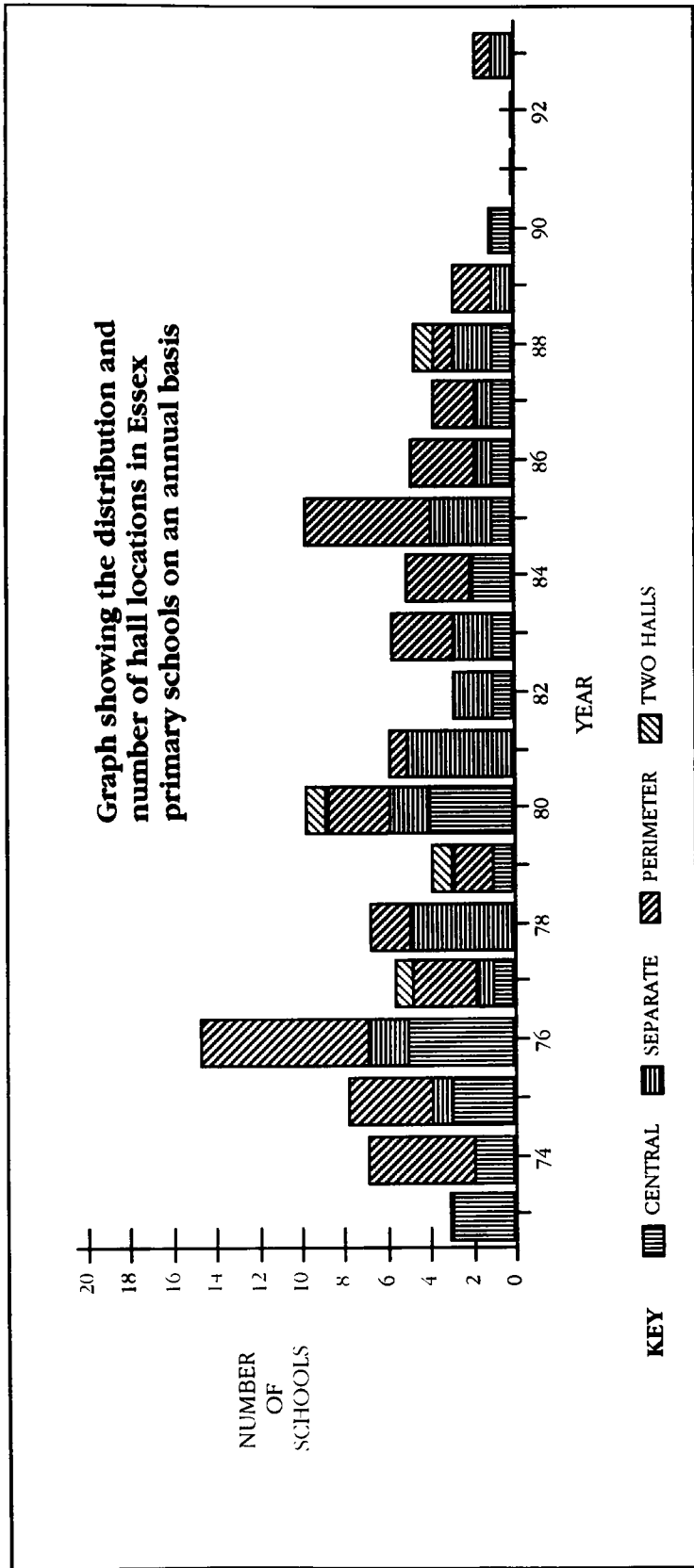


ILLUSTRATION D38 - FREQUENCY OF HALL LOCATION
Showing the popularity of different locations since 1973

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

The main disadvantages are potential difficulty in achieving good sound insulation to surrounding spaces, difficulty in isolation from other accommodation for community use out-of-school hours, difficult natural lighting and ventilation, and no possibility of a view to the outside.

This solution proved to be popular with many of the earlier primary school designs with 28 schools adopting this format between 1973 and 1980.

Separate

This solution involves the provision of the hall, administration and staff accommodation in the form of a separate pavilion, often linked by the main entrance lobby to the teaching accommodation block.

The main advantages of this form of development are the excellent sound insulation from other teaching accommodation, good natural daylighting and ventilation, simple isolation for out-of-hours community use and easy architectural articulation of the higher volume.

The principal disadvantages are its poor access from most teaching bases and a relatively expensive building form, especially when using certain building systems.

The separate hall has also been a popular planning solution with 29 schools adopting this format.

Two halls

A few of the larger primary schools are of such a size that they require two halls to cope with timetabled activities, often with one hall used for younger and another for older pupils. Various combinations of central, perimeter and separate halls have been used, all with their relative advantages and disadvantages. Only 4 schools built during the study period were of a size to justify twin halls.

5.8 LIBRARY/RESOURCES AREA

Although many classes will have text books and other resources next to or within the classbase, a certain amount of this material will need to be stored centrally in a library or resources area, as the schools finances will only stretch to a few copies of some books. It is vital that this area is located centrally with equal access to all. It is also important that pupils can browse through the book stock and refer to certain reference books at source in a small study area away from the busy classbase. (see illustration D39)

Study bays

Most libraries in the past were provided in a bay opening off a major circulation space, although more recent schools have seen their combination into a separate multi-purpose AVA/Library room. Schools commented that the central position of their library bay gave easy access from most classrooms, but others complained that their proximity to major circulation routes reduce effective space through intrusive noise and disruption. (French, C. P., 1994n)

Shared with amenity room

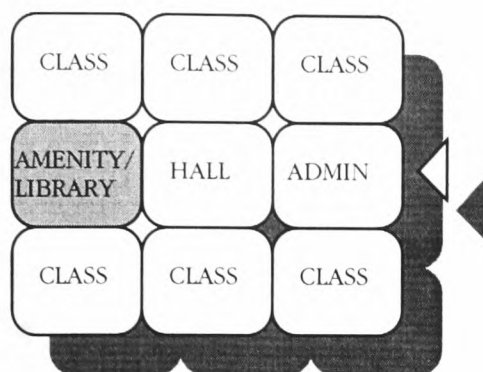
Some of the more recent schools have a shared library and amenity room, which it is claimed works well, providing the amenity room has natural lighting and ventilation with dim-out rather than blackout facilities. (French, C. P., 1994o)

Dispersed facilities

Most primary schools have one library area, but there appears to be a good case in the larger schools with more than 10 classbases for the library space to be split into two areas, with one part located amongst the infants classbases and the other amongst the juniors.

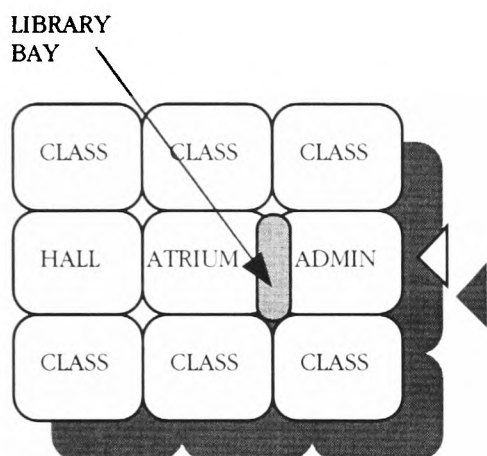
Secondary space

Three schools visited had provided a library within a central glazed courtyard or atrium shared with other activities. One of these was seen to be very successful, having its own natural space at one end of the atrium, but the other two were thought to have a poor environment, over-heating in summer and under-heating



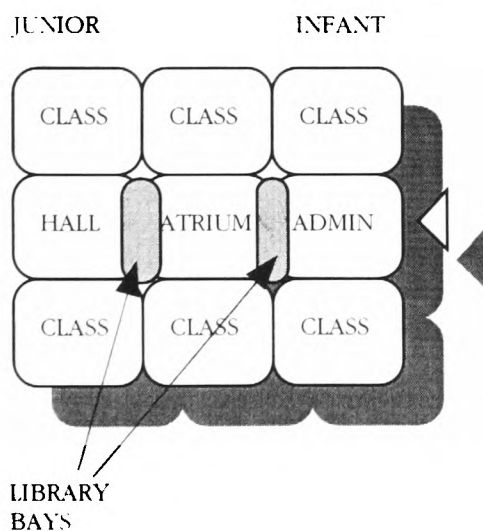
SHARED

This arrangement involves the sharing of a combined amenity/resources room for specialist activities including music, watching TV and reading books etc. This has been particularly popular in smaller schools recently.



BAY

This arrangement involves the fitting out of a bay off the entrance lobby or circulation route as a shared library for the whole school to borrow and study books etc. This has been the most common arrangement in Essex primary schools since 1973.



DISPERSED

This arrangement is similar to above, but the study bays are dispersed around the school to give better access to different age groups. This arrangement has been popular with the larger schools.

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

ILLUSTRATION D39 - LOCATION OF LIBRARY/RESOURCES AREA
Showing most popular options in Essex primary schools

in winter, restricting their use and suffering disturbance from circulation or other intrusive activities.

5.9 CLOAKROOMS

Primary schools of the 1950s and 1960s had very generous cloakrooms, often next to the main entrance, and toilets, with sufficient hanging space and storage for each pupil's coat and outside shoes. Most teachers would agree that this space used exclusively for coat storage was unreasonably generous and under-used for large parts of the day and year, especially during the summer months.

Primary school plans started to appear during the early 1970s with coat storage on mobile trolleys which were stored in the corner of the classbase when not in use, and pulled out into the classroom at the beginning and end of the day. Although this saved space, the system was not particularly liked by teachers as it was very untidy and involved considerable time and effort moving the trolley around.

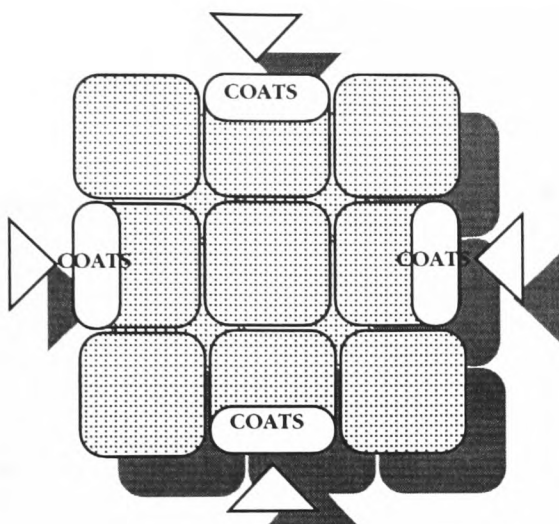
It was replaced by coat cupboards or bays within the classbase, which although more permanent, were also criticised because of the very tight space standards, and difficulty by pupils trying to access them at the beginning and end of the day. Although coat storage in current briefs is now more generous and often situated in entrance lobbies rather than classbase, teachers still feel more space is needed.

The method and position of coat storage in a primary school can have a dramatic effect on the smooth running of the school, particularly at the beginning and end of the school day and during breaks from lessons.

An analysis of 147 school plans built during the last 25 years shows there are three basic arrangements. (See illustrations D40 & D41) :-

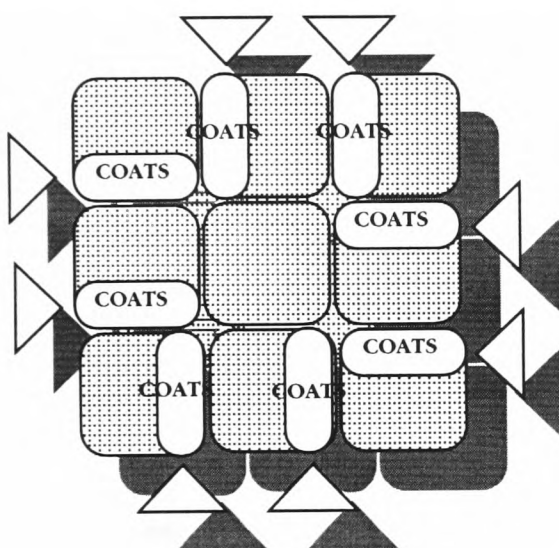
Classbase

This is where coats are stored on one wall of the classbase in a recess or cupboard, usually adjacent to the entrance from outside, or from the main circulation route. The primary advantages of such an arrangement are that space is kept to a minimum, supervision is easy and security assured throughout the day.



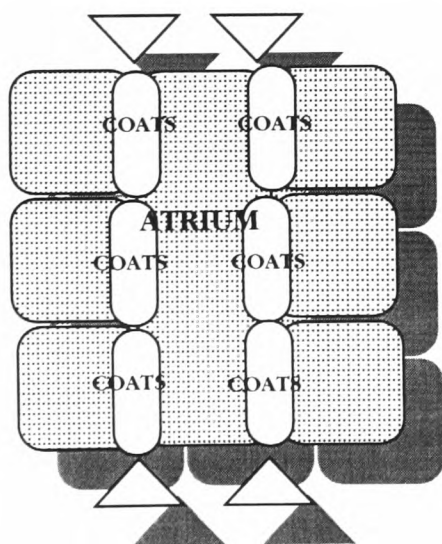
LOBBY

This arrangement has proved popular with an appropriate environment for wet coats etc. lack of space has caused problems with access, however.



CLASS

This arrangement has proved popular, but access within the class base has been problematic.

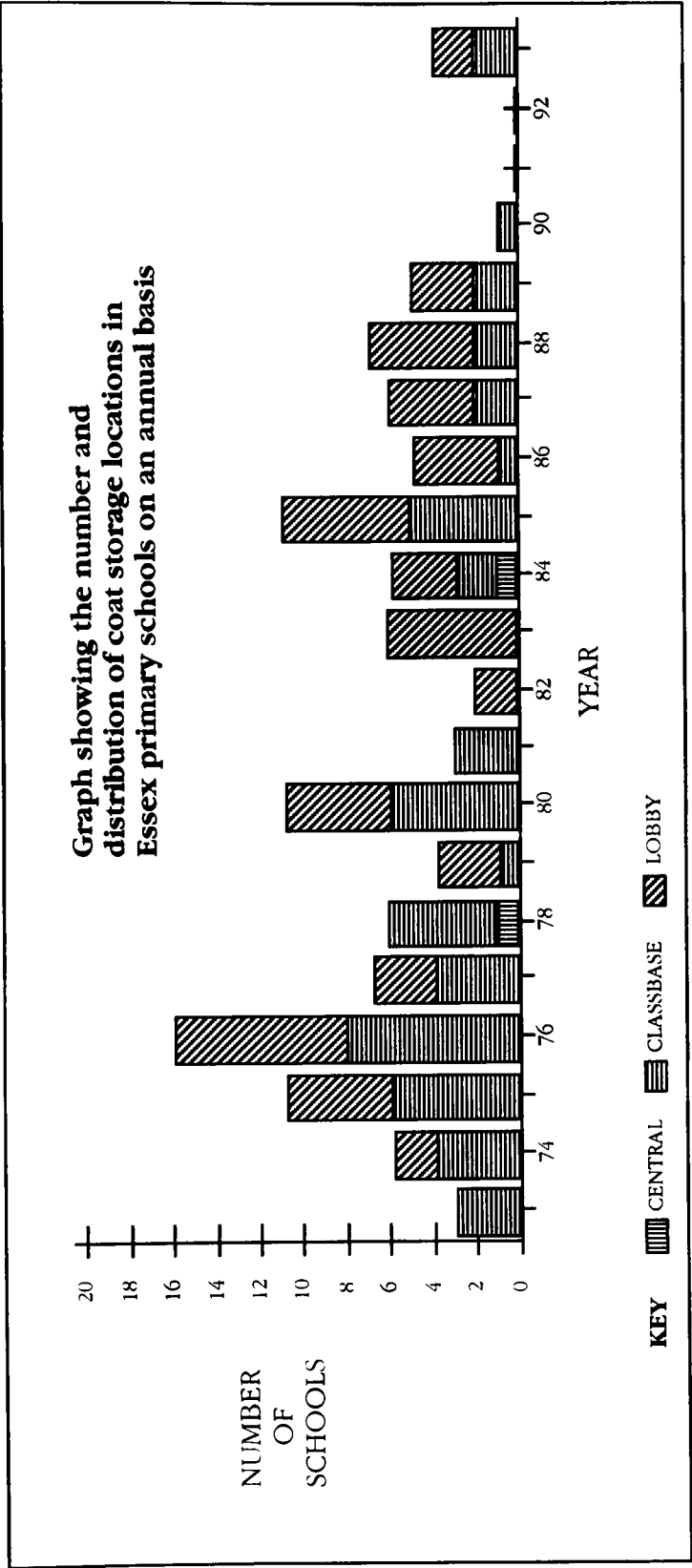


CENTRAL

This arrangement has been used fairly infrequently, but appears to be a good use of the atrium

Based on an analysis of
147 primary school plans
(see French, C. P., 1995d)

ILLUSTRATION D40 - LOCATION OF COAT STORES
Showing the limited number of locations for coat storage in
Essex primary schools since 1973



Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

ILLUSTRATION D41 - FREQUENCY OF COAT STORAGE LOCATION

The main disadvantages are that damp coats in wet weather can produce an inappropriate environment in the classbase, and a large area of an often tightly planned teaching space is sterilised as milling space for access to coats. This space has to be kept free or cleared of furniture several times a day.

This arrangement has, however, proved a popular solution with 57 Essex primary schools adopting such a plan.

Lobby

This is where coats are stored within a lobby, often sharing access to toilets and with immediate access to outside play areas. The main advantages are that coat storage can be provided in a suitable environment, with good heating and ventilation, access to outside space can be immediate, and the necessary milling space does not impinge on other activities. The principal disadvantages are that it cannot be easily supervised and children are often reluctant to leave valuable coats and bags unattended. This arrangement was equally popular with designers with 61 Essex schools adopting this configuration during the last 25 years.

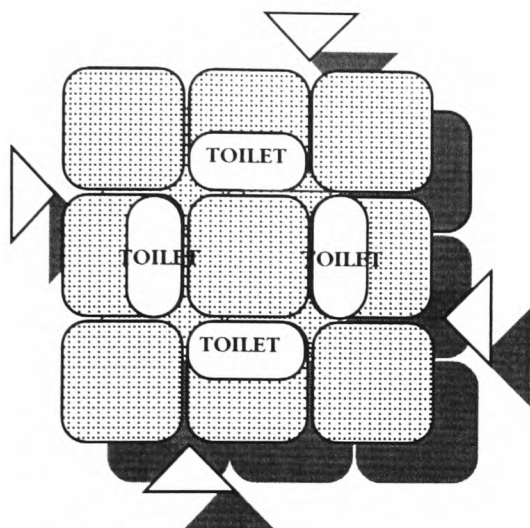
Central

This arrangement is where coats are stored in a central street or atrium. The main advantages and disadvantages are similar to lobby storage, but with the added advantage of potentially more milling space for access to coats at busy periods and better supervision. Only 2 schools have adopted this arrangement, however.

5.10 PUPIL TOILETS

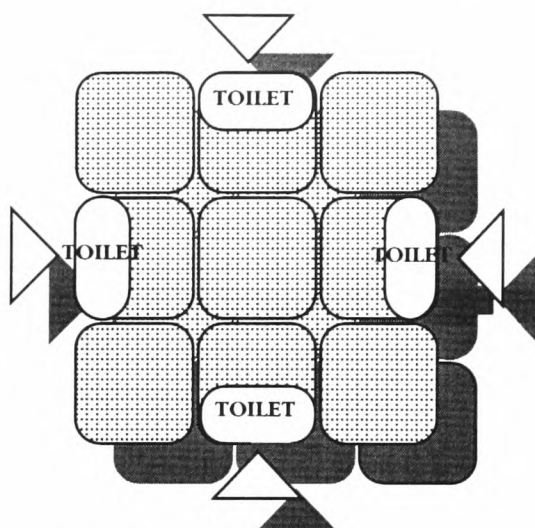
The layout and position of toilets within a primary school is another critical decision which will affect the day-to-day running of the school.

Analysis of 147 plans shows that there are four main solutions (see illustration D42 & D43) :-



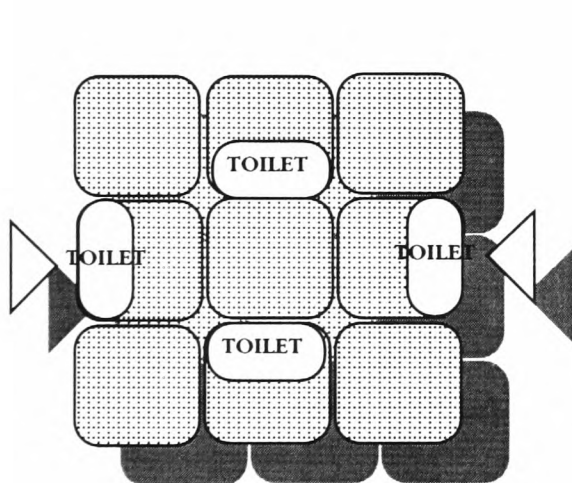
CENTRAL

This arrangement gives excellent access from class bases



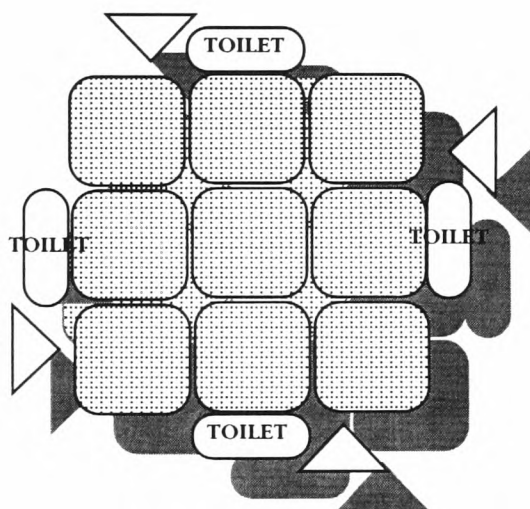
PERIMETER

This arrangement gives excellent access from outside spaces.



CENTRAL & PERIMETER

This arrangement is a good compromise giving equal access from within and without.

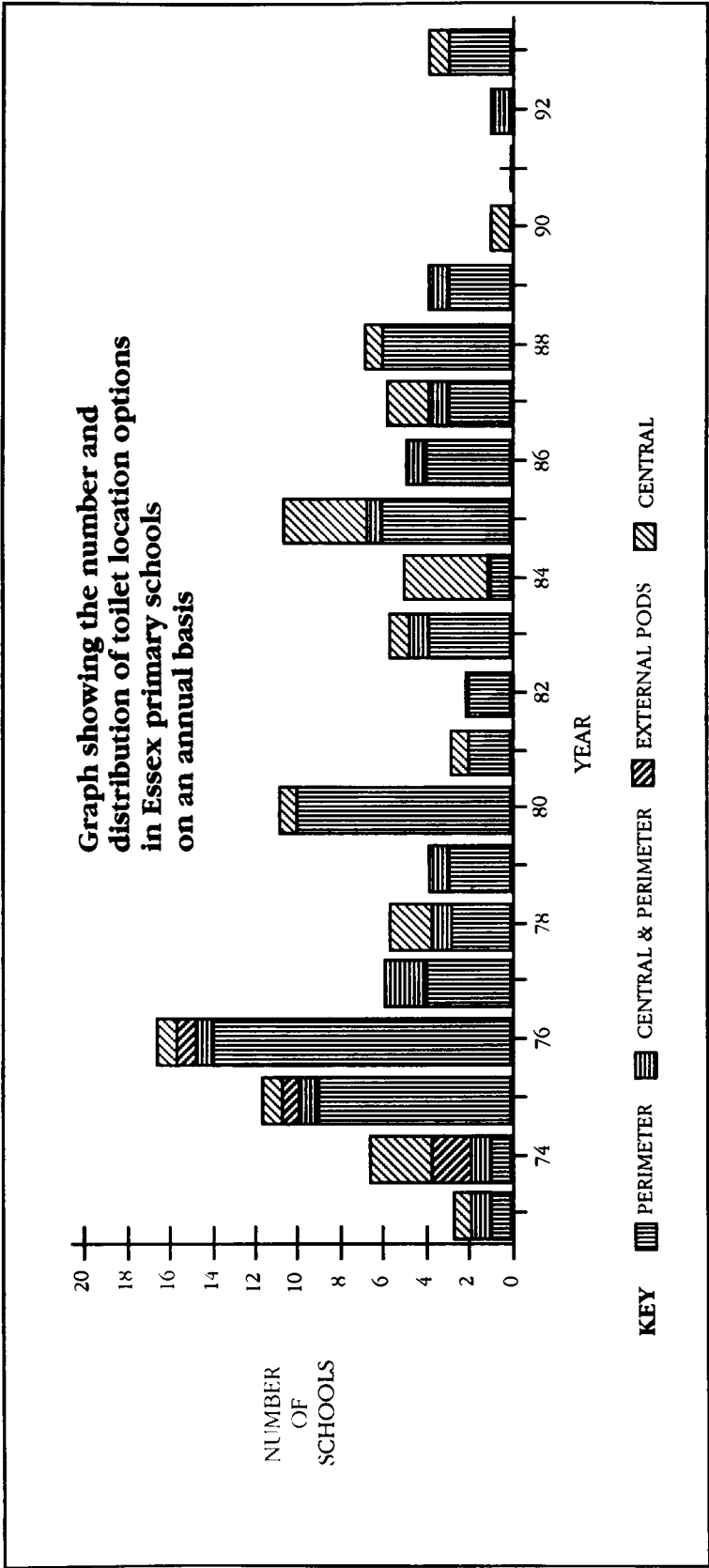


EXTERNAL PODS

This arrangement has been used infrequently and proved to be unpopular due to the difficult access from class bases.

Based on an analysis of
147 primary school plans
(see French, C. P., 1995d)

ILLUSTRATION D42 - LOCATION OF TOILETS
Showing the limited number of toilet locations in Essex
primary schools since 1973



Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

ILLUSTRATION D43 - FREQUENCY OF TOILET LOCATIONS

Central

This is where the toilets are situated around the core of the plan, often opening off an atrium or street type circulation space. The main advantages are that toilets are very convenient to teaching bases and can be easily supervised. The principal disadvantages are that pupils have to enter the main building at break times to use the toilets, and their position deep within the plan can cause ventilation problems. This is a relatively popular solution with 24 school designs adopting this arrangement.

Perimeter

This involves the positioning of toilets on an external wall, usually shared amongst several classbases with direct access from the outside or via a lobby shared with coat storage. The main advantages of this arrangement are easy access to toilets at break times and the opportunity for good natural light and ventilation. The disadvantages are potentially less good access from teaching bases and possible supervision problems. This was, however, the most popular position for toilets with 79 schools choosing this arrangement.

Combination

This is the splitting of toilet provision, with some toilets placed on external walls with direct access to the outside and others positioned near the core with access off a central atrium or street. This arrangement appears to offer all of the advantages of the other solutions with few of the disadvantages, but surprisingly only 14 school designers chose this option for their school's toilet accommodation.

External Pods

This involves the siting of toilets in external pavilions or “pods” linked to the main school building, with entrance lobbies for pupils often housing coat storage. The advantages and disadvantages of this solution are similar to that of perimeter toilets, but with distinct problems of access and supervision from the classbase. This does not appear to have been a popular arrangement with only 4 schools choosing this option during the study period.

Unisex

Generally most pupils toilets provided since 1973 have been grouped into areas serving two or four classbases, with up to four cubicles in each toilet area. Although this has proved to be a very efficient method of provision, reducing service costs to a minimum, it does have some severe disadvantages. A large space subdivided with cubicles can be difficult to supervise and can often be the scene of horseplay and bullying. If the ventilation system is not adequate, a large number of toilets in a central position can also produce unacceptable environmental conditions.

Very recent primary school plans have introduced the concept of dispersed unisex toilets for pupils with up to four self contained cubicles of domestic scale for boys or girls adjacent to pairs of classbases and this is now part of the primary school brief.

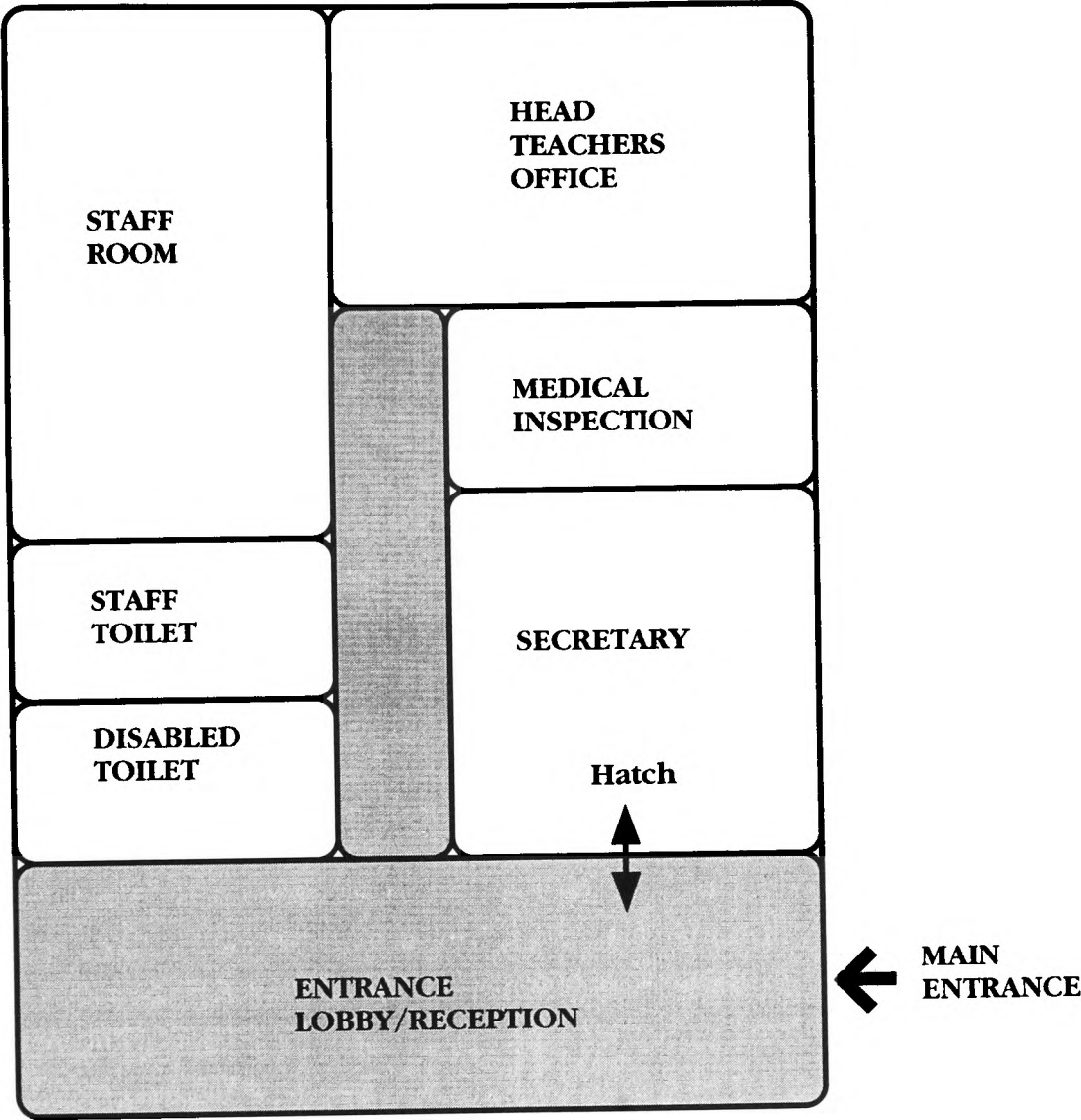
5.11 ADMINISTRATION

The Administrative accommodation in a modern primary school is under considerable pressure as it attempts to cope with the ever-increasing tasks of running a medium size business.

Most administration accommodation in Essex primary schools is located together in a suite adjacent to the main entrance (see illustration D44). This is mainly done to ensure that visitors are quickly and efficiently dealt with, and that the headteacher and secretarial staff can work together on administrative tasks without being distracted or having to visit each other in other parts of the building.

Headteacher

Most headteachers questioned were happy to be located within the admin suite and appreciated the protection this afforded from constant interruption, allowing them to concentrate on the problem at hand. Some heads thought that there was some danger of isolation inherent in this location, and would prefer to be closer to the teaching bases where they could be more involved with the life of the school. They admitted, however, that such a central location would require a headteacher with particularly good powers of concentration and a hands-on management style.



Based on an analysis of
1+7 primary school plans
(see French. C. P., 1995d)

ILLUSTRATION D44 - TYPICAL ADMIN SUITE
Showing the most common relationship
between staff accommodation in Essex
primary schools.

Staffroom

There were differences expressed about the ideal location of the staffroom, with most staff preferring to be a little detached from the main teaching bases to provide a relaxed atmosphere away from the stresses of teaching. A few teachers said they preferred to have the staffroom nearer to the centre of the school for ease of supervision and improved communications. This was a particular problem with the two schools which had staffrooms at first floor level.

Adult toilets

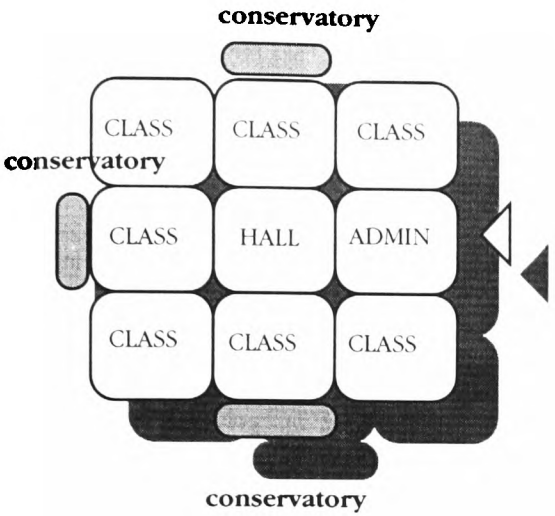
Most staff toilets are located next to the staffroom for convenience at breaktimes. They are also used for visiting adults, however, and although such a location is acceptable for the few daytime visitors this can cause some difficulty for out of school activities or lettings, when larger numbers wish to use the facilities.

5.12 SECONDARY SPACES

Many primary schools built during the last 25 years were deep plan and needed some method of introducing natural light and ventilation into the centre of the school to serve the deep plan spaces. This could be achieved using roof lights, but a more favoured device was the use of the open courtyard which gave the opportunity for a sheltered outdoor teaching and/or landscaped area, as well as providing light and air.

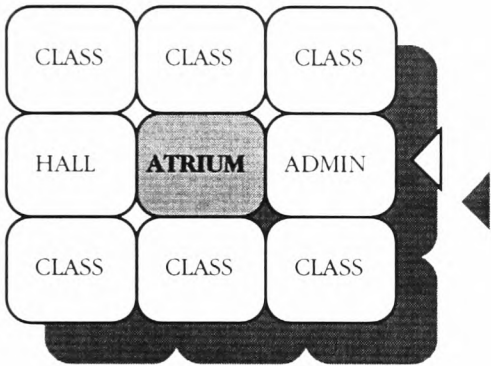
This central lung was used by designers, looking to win more space out of a restricted budget, to develop secondary space for ancillary activities. This concept has evolved and matured until the present time with many different variations during the past 25 years including atria, conservatories and glazed streets. (see illustration D45)

These secondary spaces can be divided into certain types with a clear evolutionary pattern:-



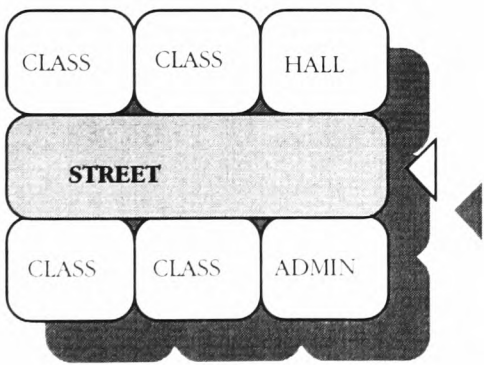
CONSERVATORIES

This form of secondary space was used in the early 1980s but proved to be unpopular and very few examples were built.



ATRIUM

This form of secondary space was used extensively throughout the 1980s and many successful examples were built.



STREET

This form of secondary space began to be used in the late 1980s and has developed into a fully serviced shared circulation/practical area in recent plans.

ILLUSTRATION D45 - SECONDARY SPACES
Showing the development of secondary spaces
in Essex primary schools.

Based on an analysis of
1+7 primary school plans
(see French, C. P., 1995d)

Open Courtyards

The open courtyard was provide mainly to introduce natural daylight and ventilation into the centre of deep open plans popular in the early 1970s. The protected space was also very useful for quiet sitting and outside teaching activities and many courtyards were paved and landscaped for this purpose. Unfortunately, some of them were not maintained and became eyesores in the heart of the school bringing the concept into disrespect.

Covered Courtyards

The first of these was the covered courtyard used successfully in schools such as Cherry Trees at Colchester, Roachvale in Colchester and Barnes Farm Junior School in Chelmsford. They were simply schools planned around a central courtyard, previously used to bring natural light and ventilation into the centre at a deep plan, which had been covered over with a solid roof and provided with an opening glazed roof light. These schools proved to be very successful, with a relatively even environment in the courtyard throughout the year allowing it to be used for a variety of uses. Unfortunately, these courtyards were also major circulation routes from one area of the school to the other, which disrupted any formal teaching activities organised by the school.

The Atrium

The covered courtyard developed into a specially designed glazed, solar heated atrium, often situated between two banks of classrooms which acted as the main circulation route and activity area, the best examples being Nabbotts Primary School in Chelmsford and Barnes Farm Infants School in Chelmsford. The narrow proportions of these atria and well ventilated opening roof lights meant that they were comfortable for much of the summer, but were unusable for certain activities in deep winter when the lack of heating and solar gain produced unacceptably low temperatures.

Conservatories

Several primary schools including Whitecourts in Braintree and Ravenscroft in Clacton also incorporated solar heated conservatories within their design, situated on the east, west, or south elevations with access direct from classbases to be used for practical activities.

Unfortunately, these spaces had small volumes, were poorly ventilated and temperatures in summer rose to unacceptable levels. In winter they dropped to unacceptably low levels with school use limited to short periods of the spring and autumn. The severe criticism by users of these poor comfort conditions has led to their demise.

The Street

The atria has also developed into the glazed street or corridor, which is used as a main spine of the primary school connecting the teaching bases and ancillary accommodation, as well as being used for other uses such as practical bays and libraries etc. These streets are usually fairly narrow with patent glazed roofs and are heated in winter to give use throughout the year. They have been successfully used at St. Peter's, Coggeshall, Highwoods, Colchester and Shelley, Ongar, although, St. Peter's has experienced overheating problems at certain times of the year due to a lack of sufficient opening lights in the patent glazing.

5.13 CIRCULATION

Primary schools are subjected to excessive patterns of movement when, for at least six times a day, the entire school moves all at the same time from classbase to hall or class base to the outside. At other times circulation is more even, with small groups of children, staff or visitors moving around the school at random. The circulation system must be able to cope with these extremes efficiently without any undue waste of space.

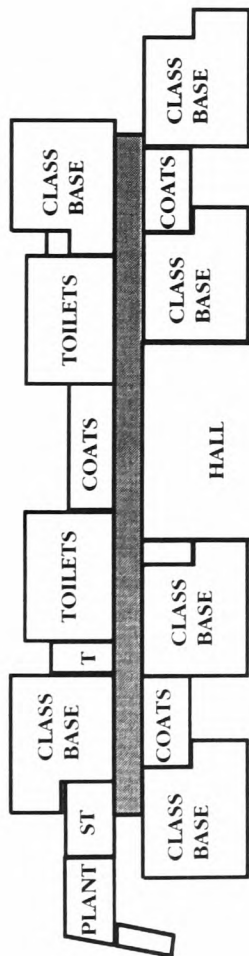
Evolutionary pattern

The older Victorian, Edwardian and post war schools of the 1950s and early 1960s tend to be sinuous, with wings of classrooms strung out along generous corridors radiating away from the hall. (see illustration D46a)

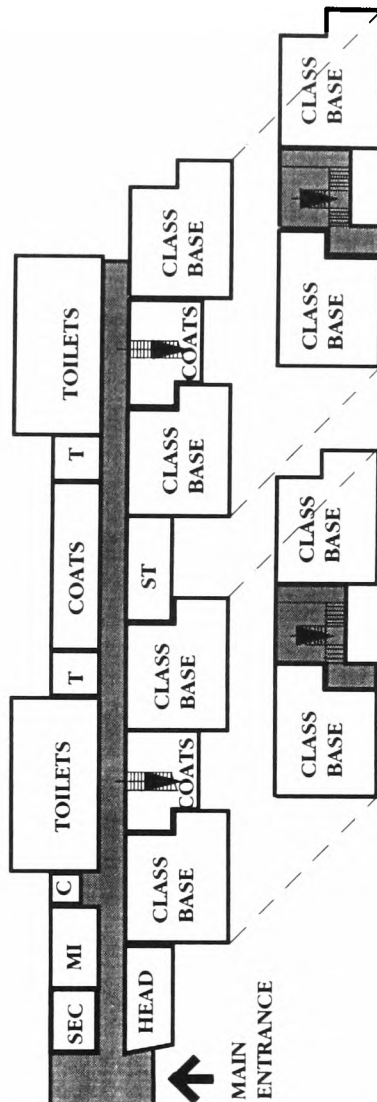
The deeper plan schools of the 1970s and 1980s often have circulation patterns buried deep within the core and have much less pure and more shared circulation space. (see illustration D46b)

The more recent street or spine plans reflect the desire by teaching staff to avoid the disruption of shared circulation and provide more direct routes to and from the school's main facilities. (see illustration D46c)

INFANTS



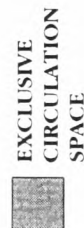
JUNIORS



GROUND FLOOR PLAN

FIRST FLOOR PLAN

KEY



This diagram shows circulation by means of exclusive corridors through out the school without interfering with class bases.

Based upon committee brochure (see Essex County Architects Department, 1971)

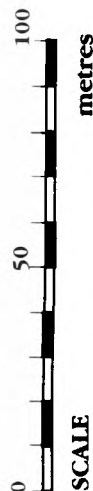
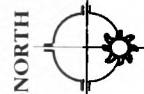
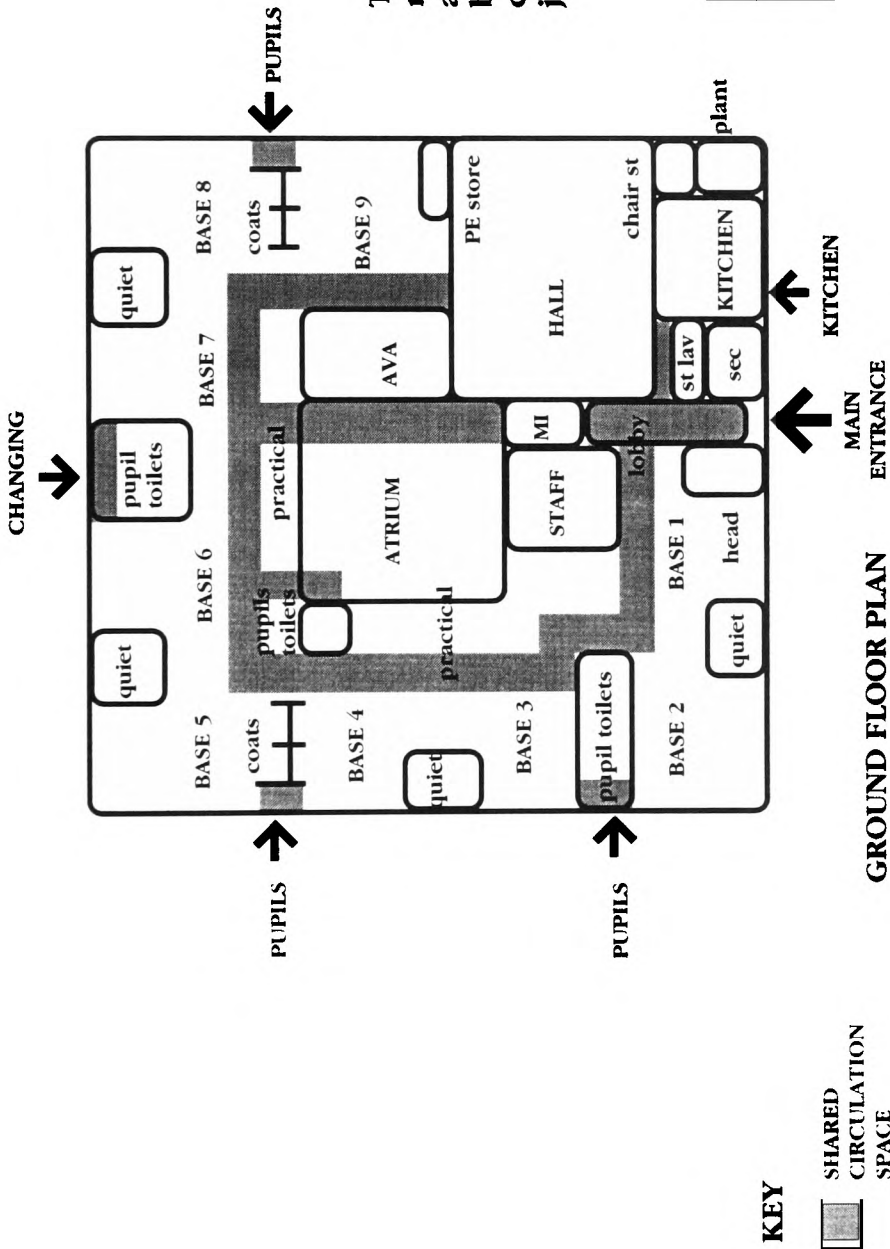


ILLUSTRATION D46a - EXCLUSIVE CIRCULATION -
MELBOURNE PARK PRIMARY SCHOOL, CHELMSFORD - 1950

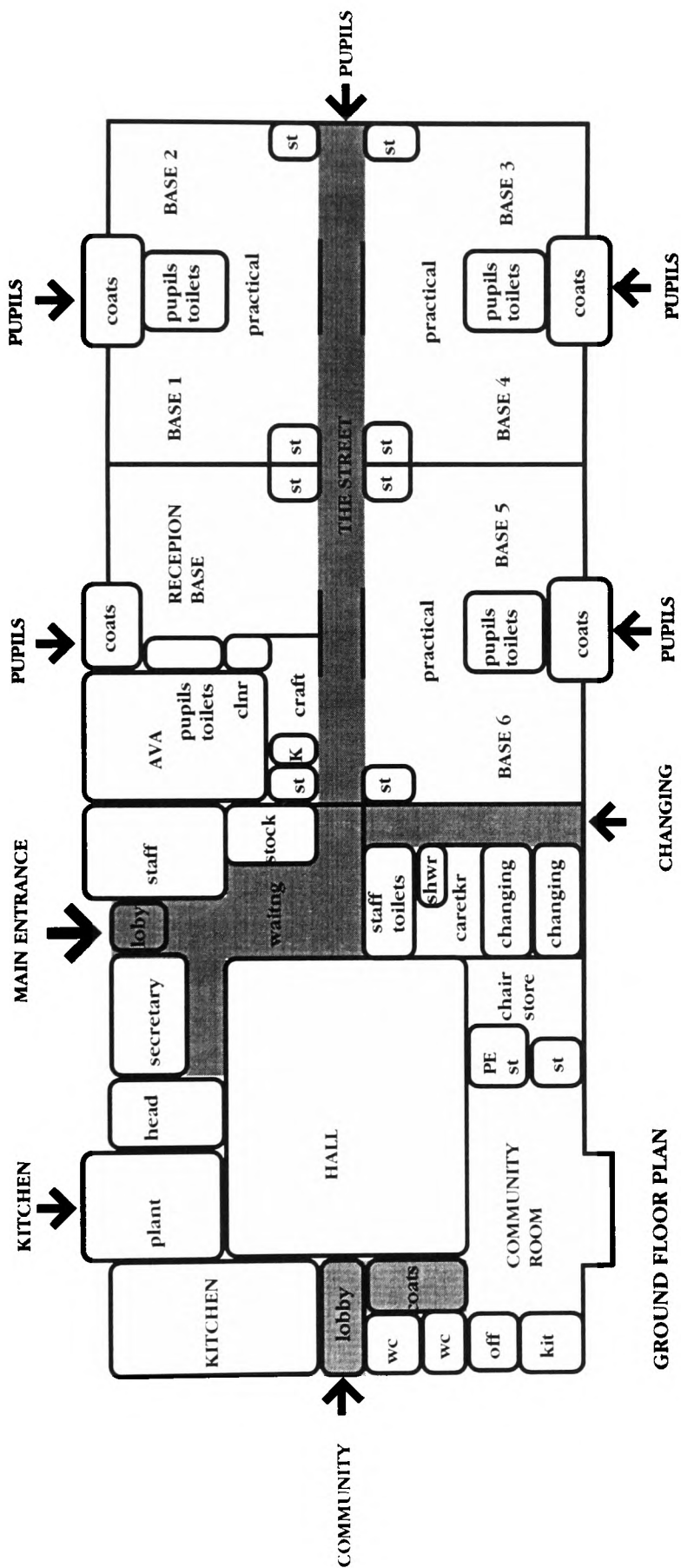


This diagram shows circulation reduced to a minimum with most actually taking place through class bases, although the atrium and hall can also be used for certain journeys.

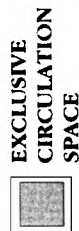
Based upon committee brochure (see Essex County Architects Department, 1979)



**ILLUSTRATION D46B - SHARED CIRCULATION SPACE -
BARNES FARM JUNIOR SCHOOL, CHELMSFORD - 1979**



KEY



Based upon committee brochure
(see Essex County Architects
Department, 1991)

This diagram shows circulation mainly by means of an exclusive street reminiscent of the "corridor" of the 1950s and partly through bases.

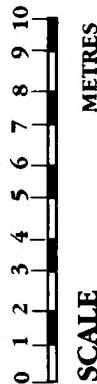


ILLUSTRATION D46C - EXCLUSIVE/SHARED CIRCULATION
SPACE - SHELLEY PRIMARY SCHOOL, ONGAR - 1993

Heirachy

Most primary schools have a heirachy of circulation, with an exclusive corridor or street, giving access for large numbers of children to the main shared accommodation, with less defined circulation spaces for smaller numbers within and between individual classbases.

Exclusive routes

Exclusive routes in recent schools tend to be those from the hall to the main entrance or from pupil entrances into classbases and may be in the form of short corridors or lobbies, and are all that is left of the old corridor plans of 1950s and 1960s schools so loved by many older Essex teachers.

Shared routes

Many of the circulation routes through today's open plan schools are not exclusive and have to be shared with other activities at different times of the day. A good example of this is the practical area, which is used by children in the classbase for messy activities, but, becomes a circulation route during break times, in and out of the classbase to the outside play facilities, or to the audio visual room or hall for other timetable activities. Individual pupils and teachers moving about between breaks to use the toilet etc., simply have to make their way between children who may be working on projects.

Some of the teachers questioned during visits to schools complained that the use of classbases, halls etc., which were already of minimal space standards, for circulation was very disruptive, especially if a different group of pupils or staff had to make their way through the space when a class was in progress (see illustration 46b).

Secondary space

Most of the schools which had a glazed secondary space at their core had to use this space to gain access either to classbases or to the outside. Many of the teachers questioned, during visits, thought that this circulation reduced the usefulness of the secondary space for other activities such as practical sessions or as a library, which had to be timetabled between break times to avoid disruption by large groups of pupils.

5.14 EXISTING SCHOOLS

Essex is a county with huge variations in its environment from the urban sprawl along the Thames in the South, through the suburbia of mid Essex, to the rural communities of North Essex. These dissimilar areas have created different types of school to suit their varying environment.

Urban Essex has many Victorian and Edwardian primary schools built on tight sites with small classbases and small playgrounds. Suburban Essex has schools built mainly during the post war period, and recent times with more generous space standards, and larger sites with ample playing fields. Rural schools are often small, Victorian in origin also on tight sites with small outside play areas.

The one thing that all these different types of school have in common, however, is the need to grow and adapt to satisfy the demand for education amongst the growing Essex population.

REMODELLING

Remodelling of schools can be necessary for a variety of reasons such as missing facilities, cramped space standards, and removal of disruptive circulation patterns. The way in which it is carried out is often heavily influenced, however, by the planning and construction of the original school.

Missing facilities

The early Victorian schools rarely have proper practical areas within the classbase, often consisting of a single sink in the corner of the room, and greater space and facilities are needed to bring them up to current standards.

These schools also lack specialist facilities for cooking, pottery, computers and quiet one-to-one activities, and they need extra spaces to meet the curriculum.

Some older schools also are without a specialist amenity room where pupils can practice music and watch television, or a library for the reading and storage of books. These same schools, however, often have large cloakroom areas with benches and pegs for the storage of outdoor clothes, largely under-used for large parts of the year, and these can often be converted to amenity space.

Many schools are finding that their reception areas are too small to provide adequate facilities for visitors, display children's work and provide the right ambience to visitors. Office spaces are also proving to be inadequate with the growth of administrative tasks, such as controlling their own budget under the LMS delegation scheme, and the storage of pupils records under the National Curriculum and attainment schemes.

Cramped accommodation

The most common need for remodelling is the presence of under-size classrooms in Victorian, Edwardian and some schools built in the late 1970s and early 1980s, when economic pressures put space at a premium. Victorian and Edwardian primary school classrooms were often designed to house up to 50 children in spaces no greater than 40 square metres, whereas today's standards are 57 square metres for 30 children. The MCB schools of the late 1970s also had relatively small classbases of 50 square metres, and often contained some element of circulation within them. (see illustration D47)

Circulation

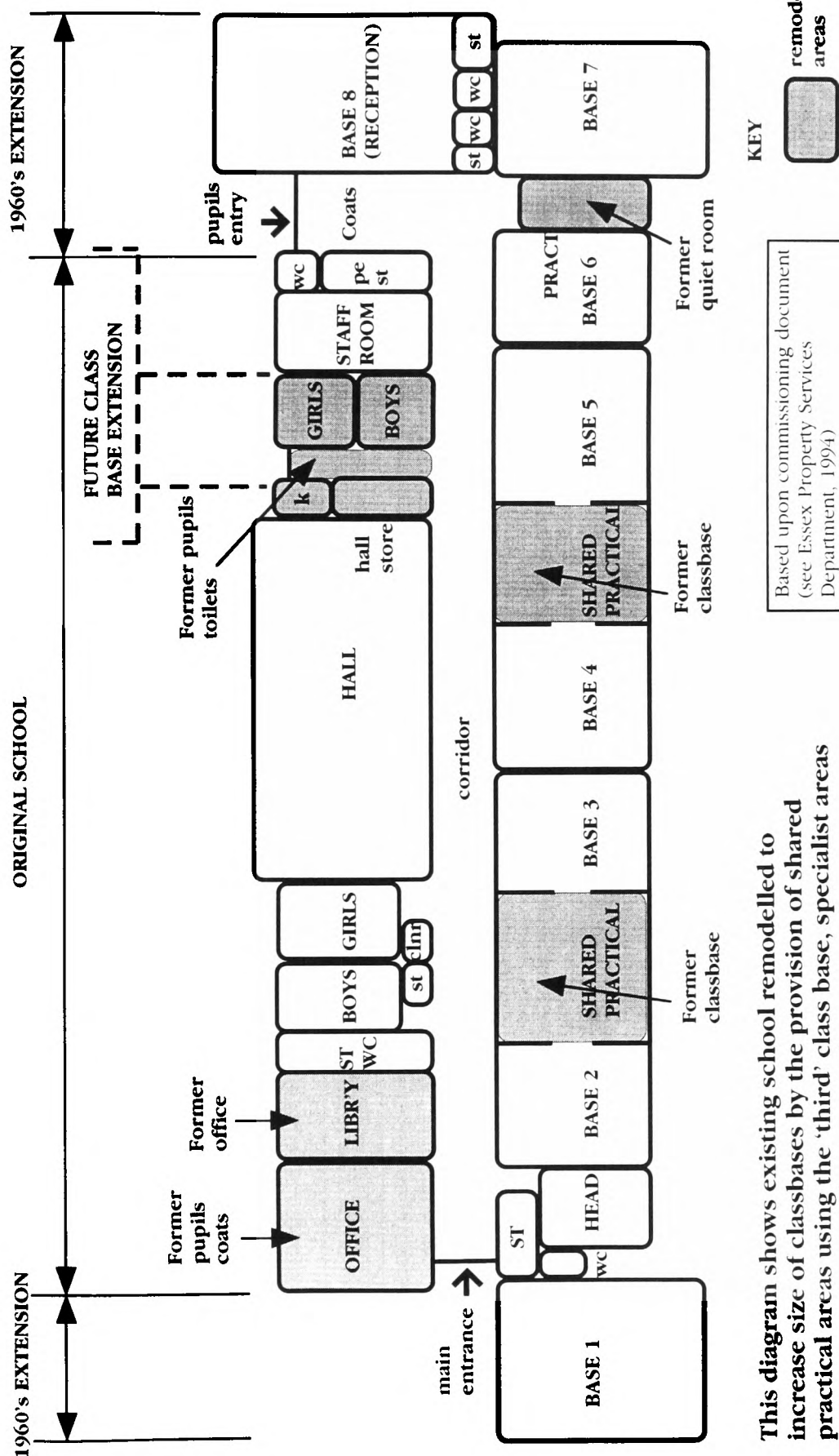
Several of the open plan MCB schools built in the 1970s and 1980s also have very restricted circulation space, with pupils expected to pass through teaching spaces at times to access toilets, coat bays and practical areas. Many schools have tried to rationalise these classbases to give clearer patterns of circulation without interrupting the teaching activities.

Link to an extension

The construction of an extension often leads to a need to remodel part of the existing school, to form a new link into the school's circulation routes by partitioning off part of a teaching space, or by reproviding storage or offices to make space for a new corridor.

EXTENSIONS

Most extensions are built to provide extra accommodation with the greatest need coming from the need to expand in size. This can come from several sources, including increased numbers on role, replacing a temporary or failing structure, part of a phased development of the school, or to provide some vital



Based upon commissioning document
(see Essex Property Services
Department, 1994)

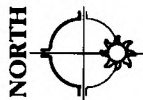


ILLUSTRATION D47 - REMODELLING PROPOSALS TO RECTIFY SPACE DEFICIENCY - HAMSTEL INFANT SCHOOL, SOUTHBEND.

missing element of teaching, administrative or ancillary accommodation. Like remodelling extensions are provided in various forms and locations depending on the layout of the original school and its site pressures.

Increased numbers

Pressure of increased numbers on a school can arise from a new housing estate built locally, parental choice favouring a popular school, or some form of re-organisation where two schools amalgamate onto one site and the other closes. Increased numbers can lead to the need to provide extra classbases, a larger hall, more cloakrooms and toilets, and ultimately greater administration space, staffrooms and ancillary spaces such as kitchens and storage.

Replacing temporary accommodation

Much of the post war pressure on pupil numbers in Essex, especially during the 1950s and 1960s, was satisfied by the use of new, cheap, quickly erected timber framed schools, and extensions to existing schools. These structures, however, have weathered poorly over the years and now need to be replaced, often with a new school or extension in permanent construction.

The continuing pressure of rising numbers throughout the 1970s, 1980s and 1990s combined with restricted construction budgets, led to the use of numerous timber framed demountable or relocatable classrooms on primary school sites, which will also have to be replaced at some time, with an extension in permanent construction.

Phased development

Many primary schools in Essex built during the past 20 years serve areas with a gradually expanding child population, and their development has been phased to suite the growth pattern of these estates and restricted budgets. Later phases of development are often in the form of an extension to the main school building housing further classrooms or a second hall, etc.

Missing facilities

Several older schools built during the Victorian and Edwardian period have developed more slowly over the years and still have accommodation more appropriate to that earlier age. They often need to provide basic accommodation to bring them up to current standards, with an extension to provide a separate hall, inside toilets, amenity room, library, staffroom or office.

Site constraints

The successful provision of an extension to a primary school depends on the overall layout of the school and its site.

Many of the urban and rural Victorian primary schools are built on very tight sites, with minimal play areas and boundaries close to buildings, and it is often difficult to find sufficient space for an extension without affecting the external play and teaching spaces.

The larger suburban sites do not usually have such restrictions, but they often have relocatable classrooms and play areas close to the building which have to be re-positioned before any extension can be built.

A new extension can also be a force for good, however, creating opportunities by enclosing external space and creating sheltered areas for outside teaching, sitting and reading, etc.

Link to existing building

The position and way in which a new extension is linked to an existing school depends not only on site space and configuration, but also on the internal layout of the school.

The older Victorian, Edwardian and post war schools of the 1950s and early 1960s tend to be sinuous with wings of classrooms strung out along corridors radiating away from the hall. It is often appropriate to build extensions at the ends of these wings linked directly into the exposed end of the corridor. (see illustration D48a)

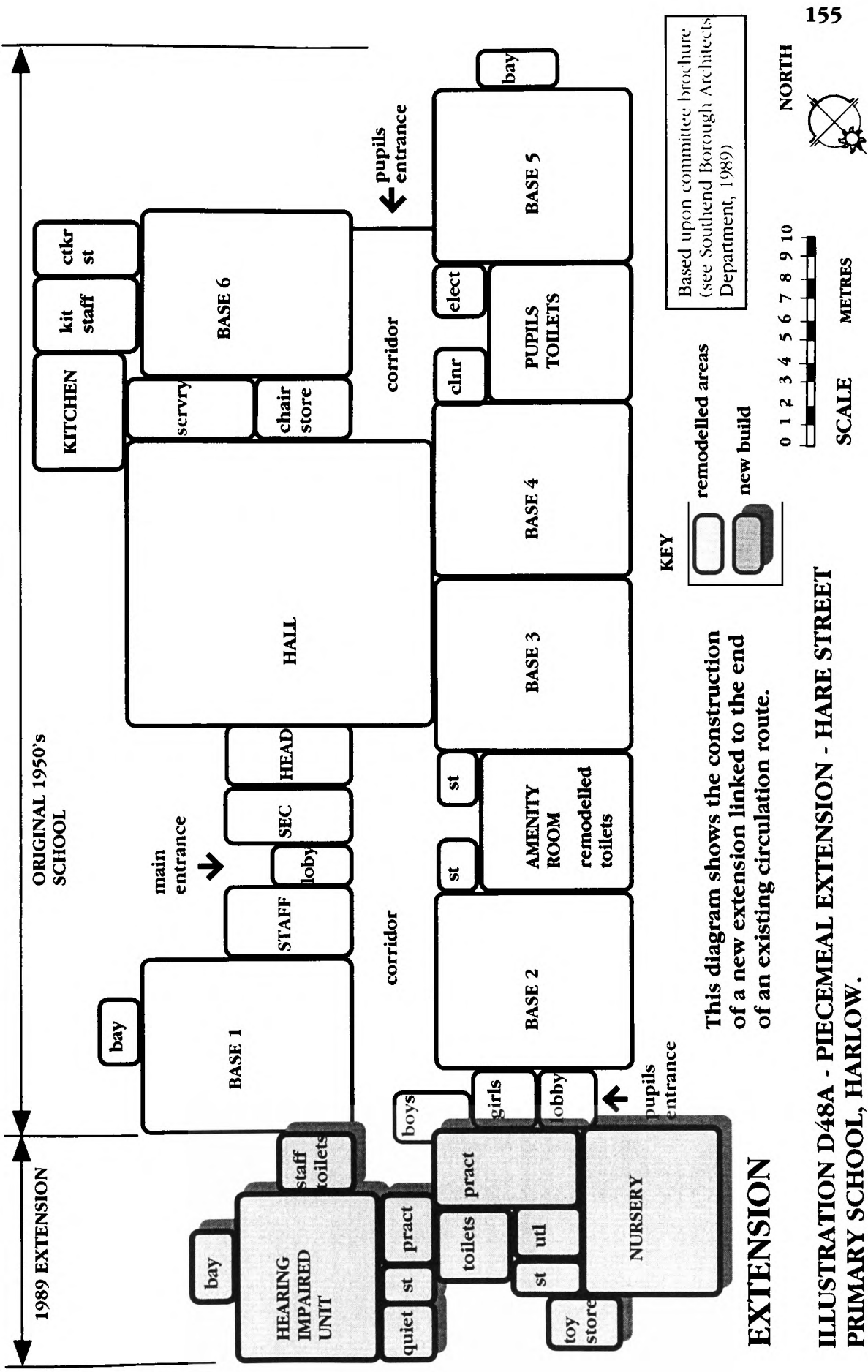
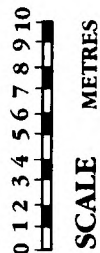
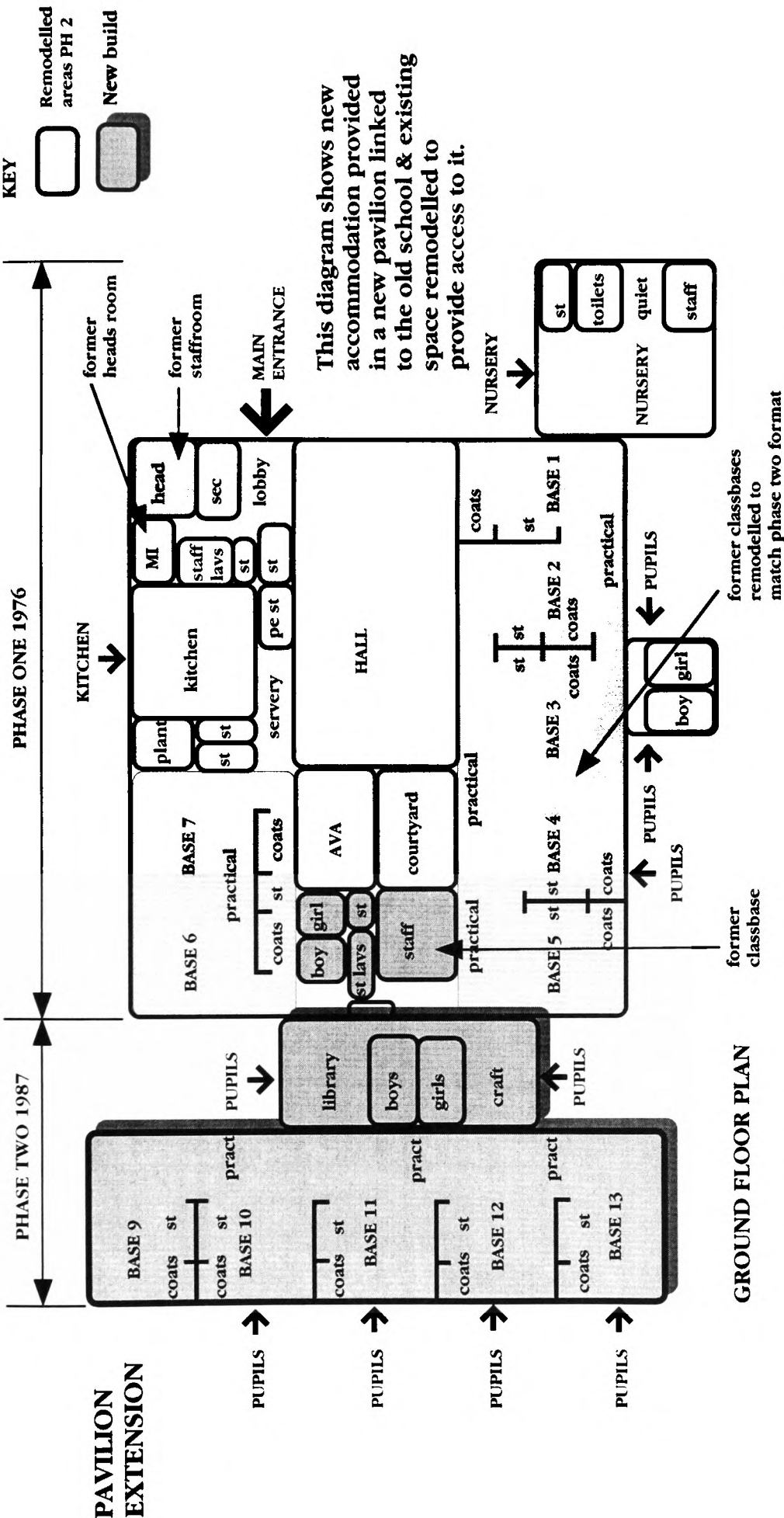


ILLUSTRATION D48A - PIECEMEAL EXTENSION - HARE STREET PRIMARY SCHOOL, HARLOW.



**ILLUSTRATION D48B - EXTENSION IN PAVILION
FORMAT - CANN HALL PRIMARY SCHOOL,
CLACTON.**

Based upon committee brochure
(see Essex County Architects
Department, 1986)

The deeper plan schools of the 1970s and 1980s often have circulation patterns buried deep within the core and greater success can often be achieved by building the extension as a separate pavilion, linked to one of the external access points with an umbilical cord. (see illustration D48b)

There are, of course, many other variations of these two basic types of extension of which Essex has many examples.

5.15 CONCLUSION

This study of 25 years of primary school planning in Essex raises many issues and lessons for the future including :-

- It is clear that the layout of any primary school must locate the various elements of accommodation into a configuration which suits the natural movement patterns between spaces and the life of the school. It should also allow the school to expand and change without undue disruption of existing relationships.
- A study of past Essex primary school plans built since 1973 shows a clear evolutionary pattern, with the development of a limited number of generic plans responding to the pressure of the time and no doubt further generic plans will evolve if pressures change.

Generally the Essex primary school has been deep plan, developed around a central courtyard or atrium, providing light and ventilation to the accommodation at the core. Classbases have normally been paired, with a close relationship between those elements most used by pupils including practical areas, quiet areas, toilets and coat stores.

- The deep plans of the early years were a solution to the open/flexible planning philosophy of the time, whereas the courtyard plans which followed were a reaction to the environmental problems caused by deep plans and an appreciation that their total flexibility was not required.
- The development of the glazed street or spine is a further evolution of the atrium into a more regular, properly heated, ventilated and lit space, forming a spine to the building which can be used for circulation and other specialist activities throughout the year.

- The addition of missing facilities to existing schools which has continued throughout the study period, is difficult to categorise into generic solutions as much of it has been dictated by the space and layout of individual schools, existing sites and buildings but there is much to learn from how certain types of building have been successfully extended.
- The twin classbase is a firm feature of the Essex primary school which appears to have worked well, giving opportunities for sharing without reducing the sanctity of the individual teacher's sphere of influence.
- There appears to be very few different options for the location of practical areas in Essex schools each with its own strengths and weaknesses. The central and dividing arrangement of practical areas which allows paired classbases to share a larger space has been equally popular over recent years with the less popular perimeter siting restricted to the early years between 1974 and 1978.
- Group or quiet rooms were provided as an integral part of Essex primary schools to provide withdrawal space from the noise and distraction of open plan layouts. These rooms were consistently used as classbase dividers in the early years, or grouped together as a central resource, but as schools have become more cellular and space diverted to the self-contained classbase they have virtually disappeared from the brief.
- The trend during the past 25 years appears to favour the perimeter position for the hall which has been the most popular location in Essex, with the central and separate a close joint second. Most hall options have been evenly used throughout the period, although the central hall has been used less during later years.

Generally the schools with slightly detached halls liked the sound insulation provided between the hall and classrooms, and the ability to shut the hall off for community use out-of-school hours. The few schools visited which had centrally located halls surrounded by classrooms liked the direct access, but found that noise was intrusive and out-of-hours letting difficult.

- The location of the library or resources area needs to be central with equal access to all pupils. It appears that the provision of a bay off the major circulation route is an effective use of space, but sharing with a more

contained amenity room may provide a more focused environment. The larger schools also need to consider the dispersal of library facilities to improve access and allow specialisation for different groups of pupils.

- It would appear that there are only two main locations for coat storage in modern primary schools, in the classbase or in an access lobby/secondary space, with the latter being more favoured recently. Whatever the pros and cons of each arrangement, users agree that greater space is needed for the storage of the myriad of coats, bags and footwear of today's pupils.
- The variation in the location of toilets is again limited, with the trend for siting of toilets appearing to favour the perimeter solution, with the central and combination siting equally favoured. The perimeter solution was particularly popular from 1975 to 1980, whereas external pods were only used in the early 1970s.

Users of Essex primary schools appear to be relatively satisfied with the design of toilet areas, but it is interesting to note that they are very enthusiastic about the use of unisex self-contained cubicles to reduce the occurrence of unruly behaviour.

- Generally administration facilities have enjoyed a remarkably consistent layout over the last 25 years and were thought, by most schools, to be well located together in a suite near the main entrance, although some teachers could see a benefit in the headteacher and staffroom being more centrally positioned closer to classbases. Schools would also like to see greater space in offices and staffrooms, however, to cater for the increasing workload and numbers of ancillary staff.
- The pressure to reduce the areas of Essex primary schools over the last 25 years has led designers to look at covering internal courtyards, light wells and circulation with glazed roofs, to make better use of this secondary space for practical activities at certain times of the year. The Education Department is keen that any further provision of this nature should be to full environmental standards, and it looks likely that such space will be squeezed to no more than a narrow street or corridor.

- The circulation pattern in a primary school is critical to its success as a functioning building and although such spaces have been considerably reduced in area over the past 25 years, and some sharing introduced, it is still important that a hierarchy of circulation is recognised and appropriate spaces provided in new schools.
- Much of the building work at Essex primary schools since 1973 has been concerned with the provision of new and major extensions to existing schools to provide extra places to suit a growing population. The slowing of demographic growth and limited budgets mean that most new building work in future is likely to involve small extensions and remodelling of existing schools. A study of such work in the recent past illustrates that there are, also, patterns of development relating to generic building types which could prove useful to future designers.

It is important, therefore, that future primary school design does not attempt to re-invent the wheel, but learns from past experience. Each new design team needs to start with a deep understanding of what is possible gleaned from a study of past precedent and appreciate the consequences of strategic design decisions when locating the various elements of accommodation.

CHAPTER 6

CONSTRUCTIONAL SYSTEMS

6.1 INTRODUCTION

This chapter will examine the various systems of construction used to build Essex primary schools since 1973 to establish what effect, if any, they had on their architecture.

It will also attempt to draw conclusions from these precedents and suggest ways in which a sympathetic construction system can add to the form and character of successful primary school architecture.

6.2 SYSTEM BUILDING

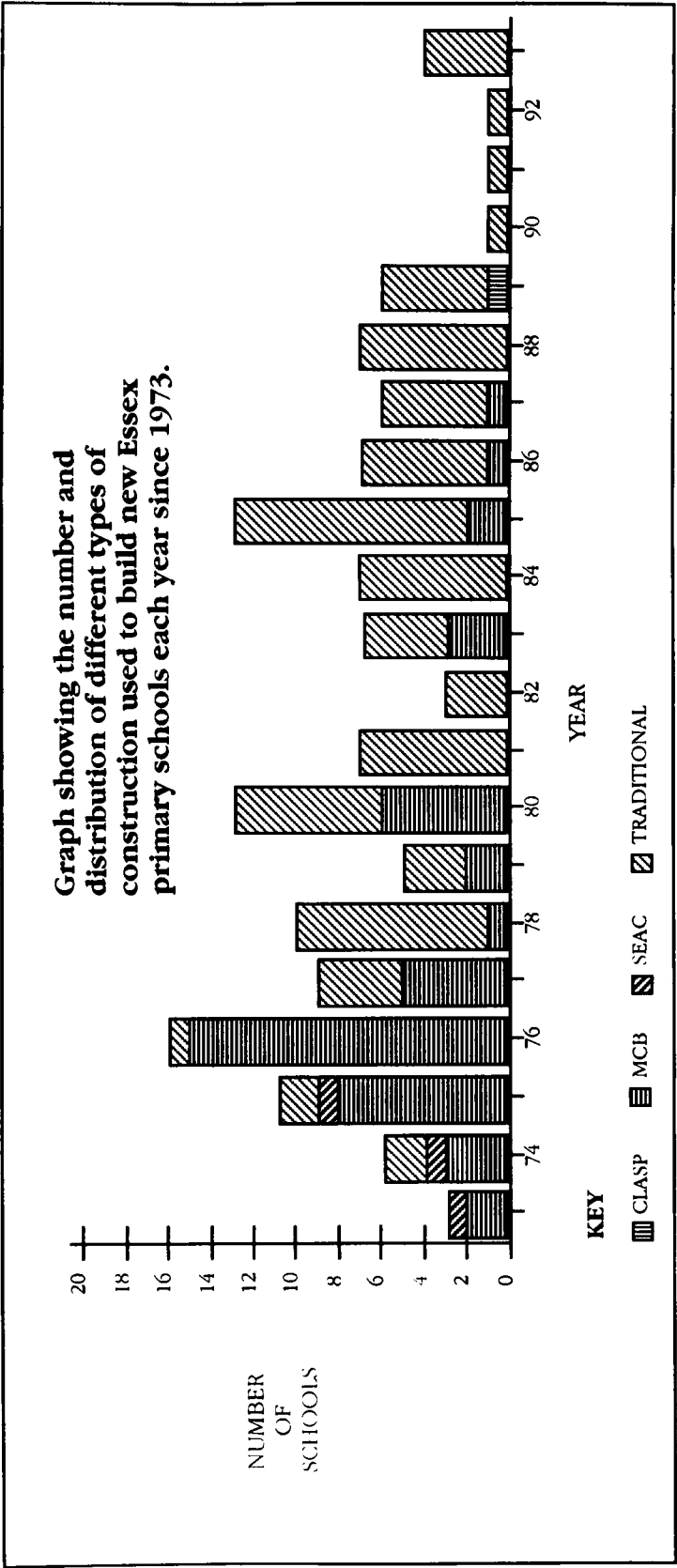
Much has been written about the frantic period of school architecture and System Building immediately post Second World War and I will not attempt to repeat this (Saint, A., 1987.). It is important to trace certain aspects of system building by consortia, however, as this had a dramatic effect upon the architecture of Essex primary schools during the 1970s and 1980s.

Essex, like many other shire counties attempting to cope with the ever-growing school population after the Second World War and the need to build new schools quickly and cheaply, was enticed into the world of system building. This had a significant effect on primary school design in the 1970s when it used its own MCB (Modular Component Building) concrete panel system extensively for new schools throughout the county, until its use could not be sustained due to lower levels of construction activity. This trend shows itself clearly in the number of projects built with different types of construction. (see illustration D49)

Post war growth

The 20 year period immediately following the Second World War was typified by a dramatic rise in the number of children requiring education, shortages of materials and skilled labour, rebuilding of war damage and particular pressures on the home counties like Essex from London overspill.

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Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

ILLUSTRATION D49 - TYPES OF CONSTRUCTION USED TO BUILD ESSEX PRIMARY SCHOOLS.

Industrialised building

Local Authority architects charged with producing the thousands of new school places required, followed a clearly documented policy of developing industrialised building systems as a way of responding to these pressures.

System built schools were born out of early post-war experiments, with framed buildings clad with factory-made components which, some have claimed, was the natural result of lessons learnt during the war from the rapid production of aircraft and the machines of war using unskilled labour. There were many experimental schools built with timber, reinforced pre-cast concrete, or steel frames clad in a variety of timber, concrete and steel panels promoted by the Ministry of Education and sympathetic Local Authorities.

Framed systems

All of these schools had a structural frame which dictated that they should be designed on a regular grid with a simple form for economy of scale, and most had relatively deep plan layouts with central corridors. The rear of deep plan classrooms were lit with clerestory windows or roof lights mounted on the flat roof deck.

Most of these schools were in the International Style with flat roofs and large areas of glazing to give good daylighting, but were relatively lightweight with poor insulation and a tendency to overheat in summer and underheat in winter.

They also used a limited range of factory made standard components in the form of cladding panels, windows, doors, partitions and suspended ceilings, although designers were free to assemble these in any configuration they chose.

The Consortia

Architects developing such systems realised that if manufacturers were to produce these components then they would need relatively large orders and continuity of supply to reduce unit costs. The obvious solution was for various Local Authorities with large programmes of new schools, to join together to form a consortium. (Department of Education and Science, 1976)

Many of these consortia were set up in the 1960s including:-

ASC	(Anglian Statutory Conference)
CLASP	(Consortium of Local Authority Special Programme)
CLAW	(Consortium of Local Authorities Works)
MACE	(Metropolitan Architectural Consortium for Education)
METHOD	(Consortium for Method Building)
ONWARD	(Organisation of North West Authorities for Rationalising Design)
SCOLA	(Second Consortium of Local Authorities)
SEAC	(South Eastern Architects Collaboration)

Most of these consortia were directly related to the development of an industrialised building system such as CLASP and its overflow organisation SCOLA, but others such as ONWARD were more interested in rationalising the local building industry using more traditional materials. Other consortia were off shoots of existing consortia specifically set up to change direction, a good example being MACE which was born from a desire of some SCOLA Authorities to produce a heavier weight system with better environmental performance.

6.3 SEAC

This was a steel framed, lightweight panel clad, flat roof system of construction developed by a consortium led by Hertfordshire County Council, with members mainly in South East England, including Essex who used it extensively for new school buildings. The main thrust of activity was during the post war period (1945-1975) with its frenetic school building programmes (Saint, A., 1987).

The continuation of building systems such as SEAC with their structural frames and cladding panels created a discipline based on a structural grid, leading to simple repetitive plans (S.E.A.C., 1970).

The use of flat roofs to cover these system buildings meant that plans could be deep, with natural lighting produced by means of clerestorey or roof lighting. Several two storey primary schools were built in the early 1970s, no doubt as a result of the economies of the SEAC frame. The International Style of Architecture created by the lightweight systems was also evocative of the period reflecting the period of renewal and hope for the future following the War, and was generally accepted by the people of Essex.

The system

SEAC was a steel framed system building using lightweight glazed asbestos cement panel cladding and galvanised and painted steel doors and windows. The roof was formed with steel panels covered with fibre board sheeting and asphalt waterproofing. This system was in extensive use throughout the late 1960s mainly for secondary schools with their multi-storey construction, but some primary schools were also designed using the system. (see illustration D50)

The consortia members

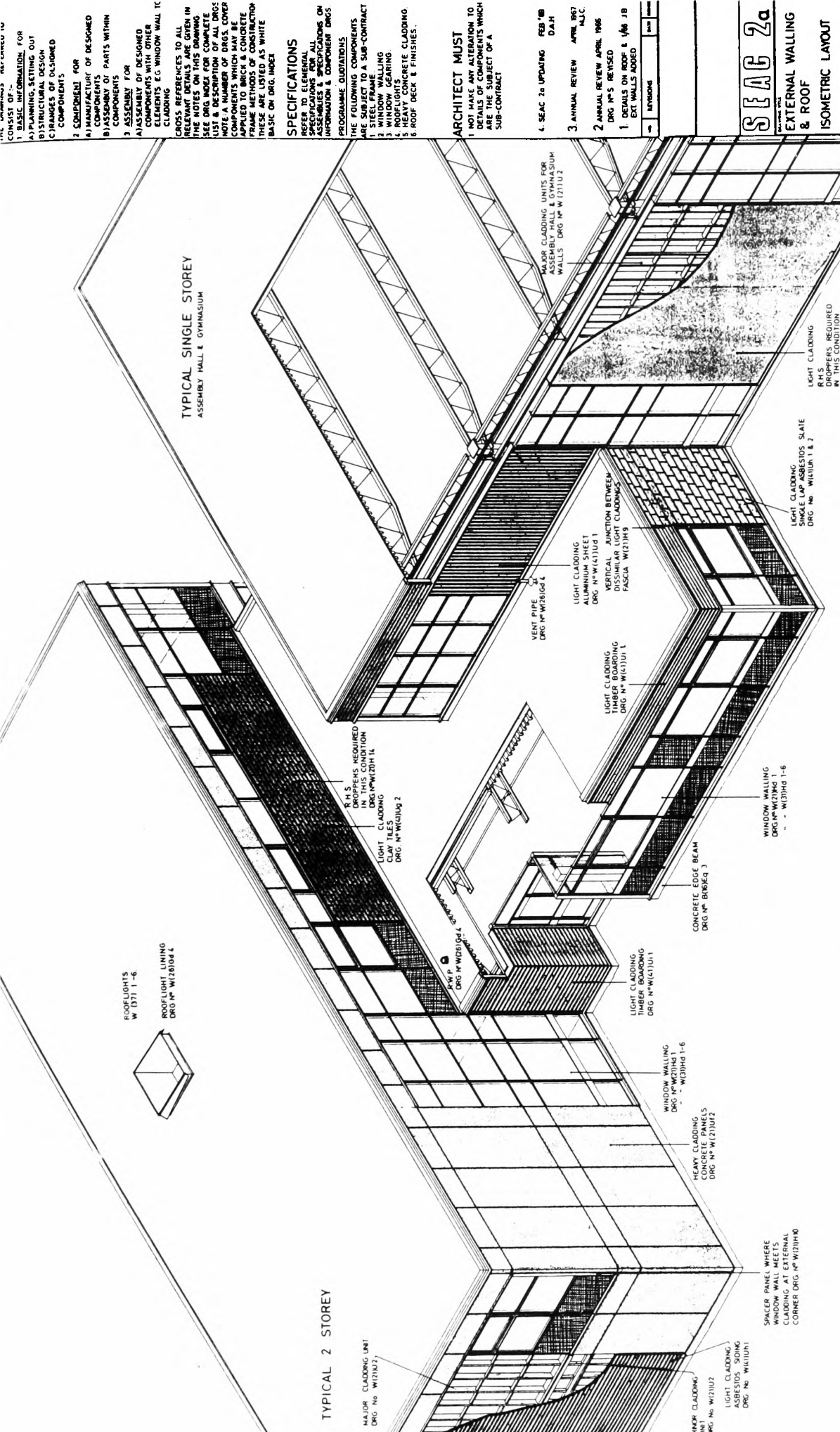
Essex County Council was one of the founding Members of SEAC, together with Hertfordshire and Kent. The County Architect, Harold Conneley was very committed to the system and several members of his staff were seconded to the SEAC Central Development Group based in Essex at Epping. The County Architect's Department also had responsibility for developing the range of loose and fixed furniture associated with the system.

Essex withdrawal

Harold Conneley retired in 1966 and his replacement, Ralph Crowe, came from a SCOLA Authority, Shropshire County Council.

He had become disillusioned with the lightweight steel framed systems like SEAC because of their poor environmental performance and had been involved in the development of the heavier weight MACE intended to replace SCOLA.

Showing the main features of the light weight construction.



SEAC 2a
EXTERNAL WALLING
& ROOF
ISOMETRIC LAYOUT

He could not convince other members of SEAC to change the system, however, and quietly developed his own Modular Component Building (MCB) system with Chamberlain and Partners, Structural Engineers. Using the reorganisation of Local Government in 1974 as an excuse, Essex County Council left the SEAC Consortium in that year (French, C. P., 1993.).

6.4 MODULAR COMPONENT BUILDING (MCB)

Ralph Crowe, insisted that the new highly insulated concrete panel system with its flat roof, flexible steel and reinforced concrete frame, and regular grid was ideal for the construction of primary schools, and should be used for all projects unless there were exceptional reasons why it should not.

In fact, only 49 MCB primary schools were built, mainly in the period from 1973 to 1980, (French, C. P., 1995d) before the economics of using the system on an ever-decreasing programme of work led to its abandonment in favour of more traditional methods of construction. The later projects using the system were the result of extensions to existing MCB schools where a matching style was thought to be important.

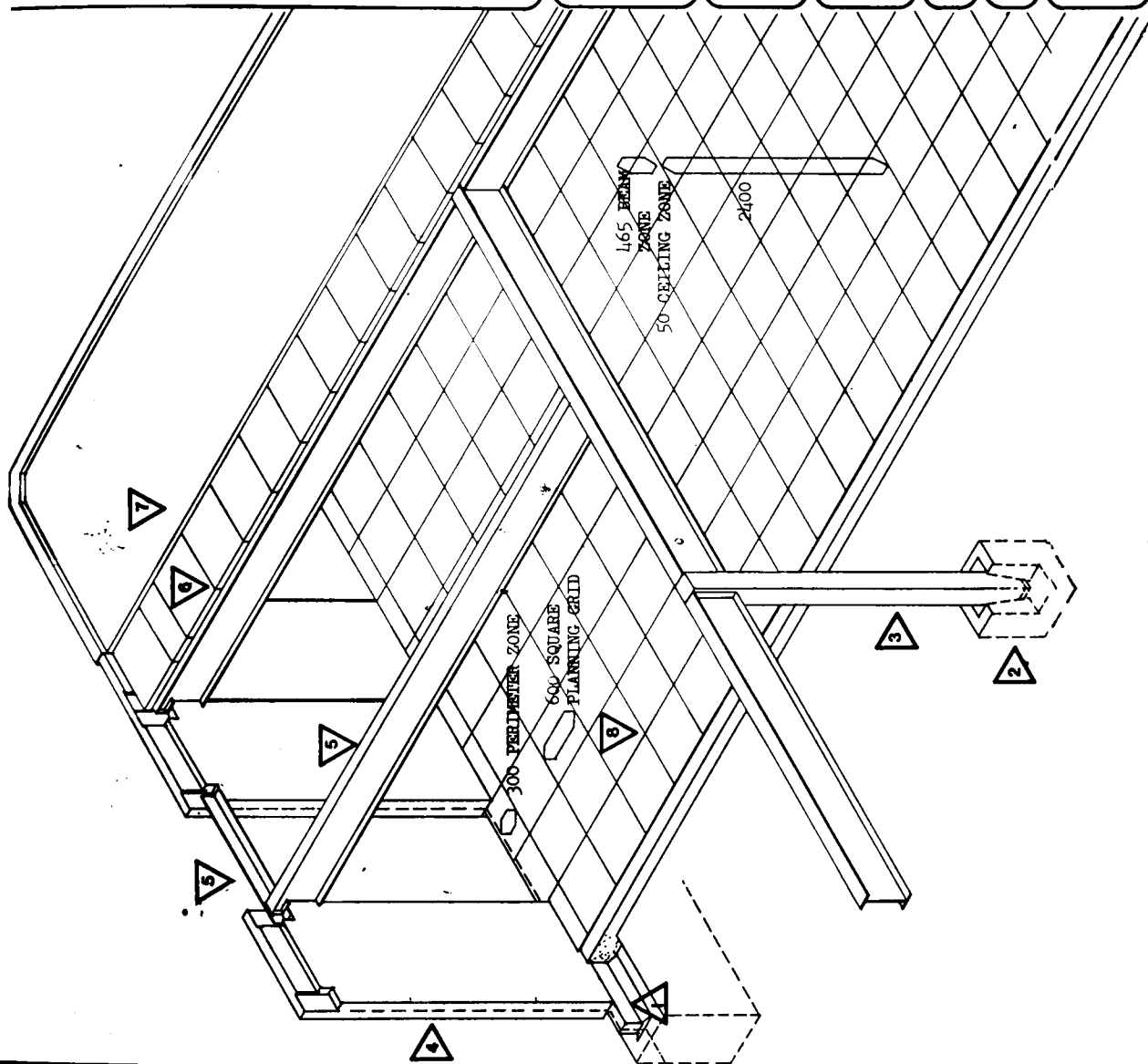
The system

MCB attempted to rectify some of the shortcomings of SEAC by replacing the steel frame and lightweight cladding panels with lightweight insulating concrete load-bearing external wall panels, castellated steel roof beams, and precast concrete columns supporting insulating aerated concrete roofing panels. Windows and doors in the external walls were restricted to small punch hole apertures with radius corner aluminium frames or gasket glazed fixed lights. (see illustration D51)

The system was designed on a grid directly related to the 2.4 metre width of wall panel, and the layout of the interior with its lack of load bearing partitions was intended to be flexible and easily rearranged to suit developing educational policy or teaching methods. Unfortunately, MCB was universally disliked by architects within the department who found the 2.4 metre grid coarse, and very difficult to manipulate in primary school design, resulting in designs which had very regular box-like plans.

Reproduced from the MCB Manual
(see ECC County Architects Dept, 1976)

Showing the heavy weight construction system



F EXTERNAL WALL:
281-WALL PANELS
336-WINDOWS
342-PLINTHS

COMPONENTS	1	2	3	4	5	6	7	8
PRECAST OR INSITU PLINTH ON FOUNDATION. ERECTED BY GENERAL CONTRACTOR								
COLUMN BASES BY GENERAL CONTRACTOR								
PRECAST CONCRETE COLUMNS BY NOMINATED SUPPLIER ERECTED BY GENERAL CONTRACTOR								
PRECAST CONCRETE WALL PANELS BY NOMINATED SUPPLIER ERECTED BY GENERAL CONTRACTOR								
STEEL BEAMS, LINTOLS AND ANCILLARY COMPONENTS BY NOMINATED SUPPLIER ERECTED BY GENERAL CONTRACTOR								
ROOF DECK SUPPLIED AND ERECTED BY NOMINATED SUB CONTRACTOR								
ASPHALTE ROOF COVERING BY NOMINATED SUB CONTRACTOR								
INSITU FLOOR SLAB BY GENERAL CONTRACTOR								

drawing number

The Architecture

The decision to develop a heavyweight structural concrete panel system in Essex had a dramatic effect on Essex school architecture. Plans evolved which were even more regular and deep than SEAC schools, with the most efficient configuration being a square, as it used the least number of expensive external wall panels. The high cost of components induced designers to keep plans tight and areas low with a consequential effect on the size of classrooms and circulation space.

Open plan layouts were also fashionable at this time and the MCB frame gave clear spans which allowed partitions to be lightweight and moveable. The constant height of the wall panels and their restricted choice of aggregate finish, parapet eaves, and punch hole windows also produced a hard architecture, alien to the pitched roof, brick, tile slate and timber clad Essex vernacular which was disliked by planners, teachers and general public alike.

It also had a very hard perimeter because of the precast concrete plinth detail which made the integration of inside and outside teaching spaces difficult.

It should be said, however, that the interiors of these schools with their coffered ceilings, hessian pinboards and carpeted floors had a high quality consistent finish often missing in more traditional designs.

It is true to say that some architects produced a very good environment for teaching using MCB, as the staff of Nabbotts Junior School would testify (French, C. P., 1995i), but unfortunately this was the exception and most architects lost, or were unable to produce, the "sense of place" necessary for a primary school to successfully serve its local community. Many people in the department also became preoccupied with the technicalities of system building at the expense of good design.

It was always intended that MCB would involve the use of a very restricted palette of components supplied by a small number of local suppliers on a term agreement. Unfortunately, the reducing capital programme and constant demand for "specials" meant that the promised savings in economies of scale were never delivered, and the system proved to be relatively expensive compared to more traditional methods of building.

The demise of MCB

Ralph Crowe's preoccupation with MCB development and abrasive personality led to many clashes with other Chief officers and several battles in committee. Ralph Crowe left the department under a cloud in 1976 to take up a teaching post at Newcastle University, and was replaced by Alan Willis.

When Alan Willis became County Architect he decided, on first appraisal, that MCB was as good as most systems, and should continue to be used until a full assessment of its strengths and weaknesses could be completed. It was eventually decided to continue to use the system on "green field" primary school sites and extensions to existing MCB schools, but other forms of traditional construction could be used on all other projects (French, C. P., 1994g).

Unfortunately, the Authority's capital programme was dramatically reduced during the period 1976 to 1988, and fewer and fewer new build, and a greater number of extensions to traditional buildings, were included in the programme. This reduced the number of potential MCB projects to such levels that the supply of the various components including wall panels, columns, windows and steelwork was no longer viable, and eventually the system had to be abandoned.

6.5 CLASP

Alan Willis, spent his formative professional years with Nottinghamshire County Council home of the CLASP system of building with its lightweight steel frame, flat roof and lightweight cladding panels. Unlike many of its contemporaries, the system was successfully modified in the 1980s for heavier weight claddings and pitched roofs and proved ideal for primary school buildings. Despite the County Architect's familiarity with the system, however, only one CLASP primary school has been constructed in Essex to date, but two more are in the design stage.

Special foundations

CLASP was used for the construction of a new primary school in 1989, serving a developing area of housing known as Chafford Hundred at Grays on the north bank of the Thames. CLASP with its flexible structure developed for mining subsidence was particularly suitable for this site which had variable foundation conditions, with possible "swallow" holes developing in what had previously been a chalk quarry serving a now redundant cement works.

The pitched roof masonry clad primary school designed by the Essex design team produced an acceptable school environment, but the poor detailing and environmental control problems demonstrates that the department has already forgotten the discipline needed when using a building system with its restricted number of components fitted together using fairly tight tolerances.

6.6 TRADITIONAL CONSTRUCTION

Even during the SEAC period Essex County Council Architect's Department had maintained a fairly healthy use of traditional construction methods with pitched roofs and load bearing external walls and partitions, where system building was inappropriate, until Ralph Crowe imposed the MCB system on designers, irrespective of site conditions, and most new primary schools were constructed in MCB.

Despite the County Council's preoccupation with system building in the 1970s and 1980s, over 90 new schools and major extensions were designed using traditional load bearing methods of construction during the last 25 years, although very few were built at the height of the MCB boom in 1976 (French, C. P. French, 1996d).

Extensions to existing buildings

As mentioned in previous chapters, Essex has a large stock of traditionally constructed primary schools with loadbearing masonry walls under timber pitched roofs covered with slate or tile, constructed mainly during the late Victorian or Edwardian period as well as the more recent flat roof system buildings.

Many of these existing vernacular buildings have been extended to provide additional accommodation in a sympathetic style, with pitched roofs and masonry walls, although several rural schools were extended in the 1960s with flat roof timber framed classbases clad with brick and timber boarding.

New build

Generally, most new primary schools built between 1973 and 1983 were constructed in the SEAC or MCB flat roof systems, but as the MCB system was phased out more and more traditional forms of construction were introduced for new schools using large span low pitch roofs over deep plan loadbearing or partially framed walls

Renaissance of traditional materials

The use of pitched roof building forms also led to more use of traditional Essex materials, and a greater affection for these buildings by their users and the general public as explained in greater detail in Chapter 7.

6.7 ROOFS

Many people have expressed a view that their abiding impression of the Essex primary school is one of buildings with flat roofs out of keeping with the traditional Essex built environment with its tiled or slated pitched roofs. Analysis of primary schools built in the last 25 years shows, however, that an equal number of pitched roof schools have been built during this period, with 68 projects using flat roofs and 75 having pitched roofs. Flat roofs dominated the first half of the period, however, with pitched roofs having a resurgence in later years (see illustration D52).

Flat roof mentality

The demise of MCB brought its own problems, however, as designers who had been used to the relative freedom of providing a flat roof over the free-flowing deep plan required by the educational brief experienced considerable problems, at first, when attempting to provide pitched roofs over such plans in an effective manner.

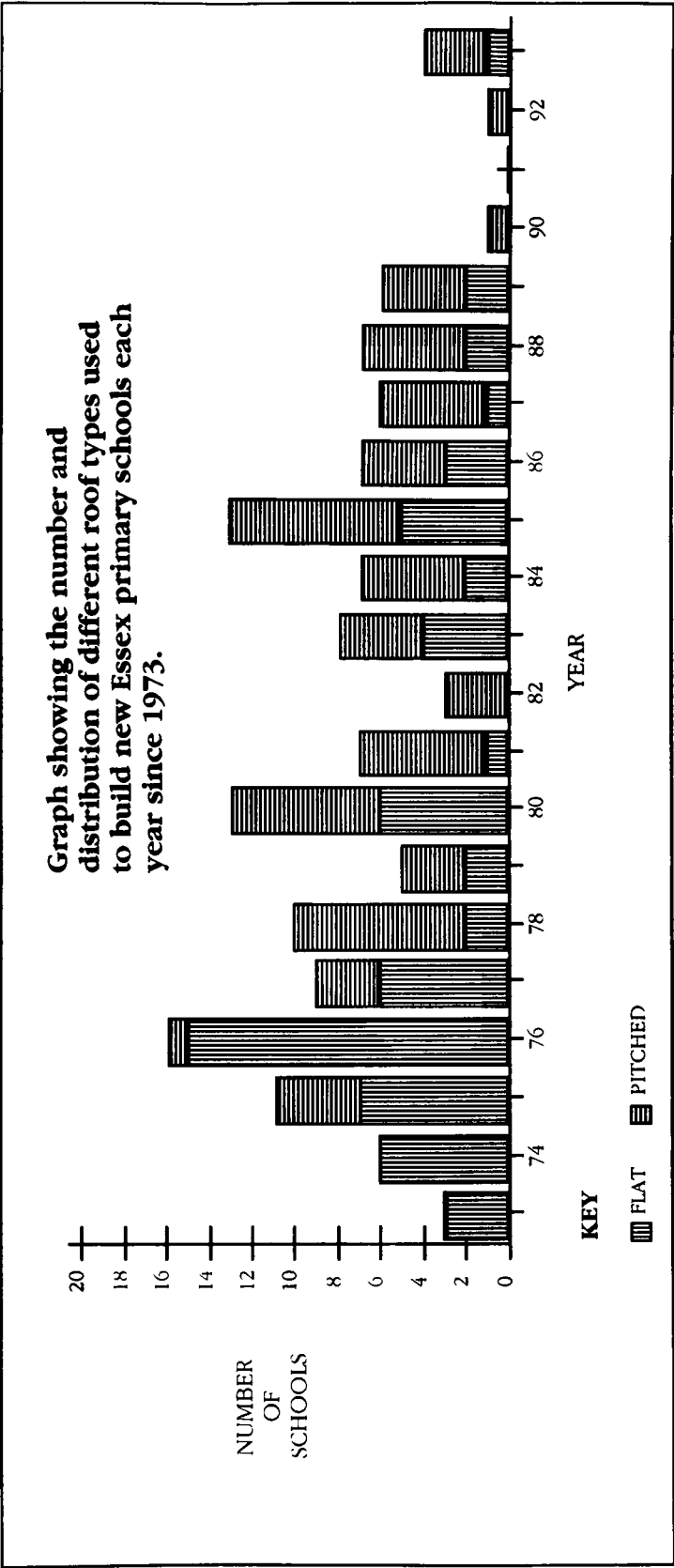


ILLUSTRATION D52 - TYPES OF ROOF USED ON ESSEX PRIMARY SCHOOLS

Based on an analysis of 147 primary school plans (see French, C. P., 1995d)

This was a universal problem amongst Local Authority Architects, however, with many having to relearn the art of pitched roof architecture (Stonehouse, R., 1984.)

Their first attempts were to simply divide the existing deep cellular plans into a series of pitched roofed pavilions linked together with flat roofs or valley gutters, affectionately known as the "chicken and hen" arrangement. The pavilions often had short span trussed rafter structures with flat ceilings below, producing a series of enclosed hats covering the plan, without any acknowledgement inside the building that the building had a pitched roof. These buildings tended to be rather dark inside due to restricted fenestration patterns and the lack of rooflights. (see illustration D53)

The big roof

As designers relearnt the relationship between plan and section they gradually produced designs which made fruitful use of the volume naturally produced by the pitched roof. (see illustration D39)

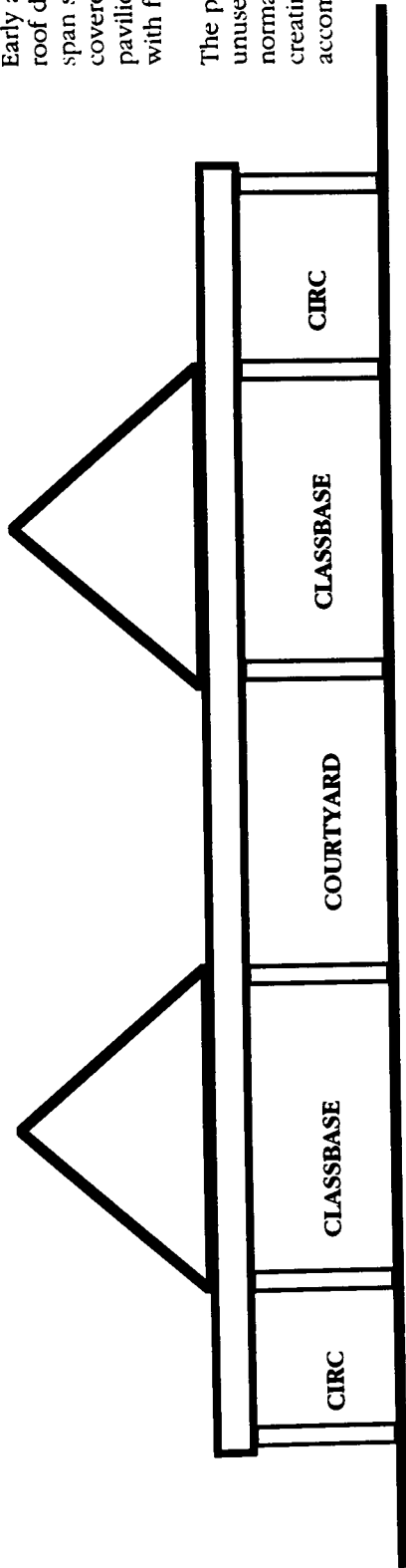
The more cellular nature of primary schools allowed more sinuous, longer, narrower plans to develop covered with a single "Barn like" pitch using the inevitable height gained over the centre of the plan to great effect, by providing daylight via rooflights deep into the building and producing natural stack ventilation. The extra height at the centre of the plan also housed spaces such as the hall which could make good use of the extra height and volume. These designs clearly matched section and plan in a more creative fashion than previous efforts, but involved the application of considerably more skill than the simple "elevated" plans under flat roofs of system buildings.

Materials

The angle of the pitched roof was, however, critical to the choice of covering materials, with the long span single pitch tending to be lower to avoid uneconomic roof voids using bland sheet materials such as colour coated steel or interlocking concrete tiles. The shorter span "hats" on the pavilion designs were able to use steeper pitches with plain clay tiles with perhaps a warmer domestic scale.

Early attempts at pitched roof design had short span steep pitches covered with tiles over pavilions joined together with flat roofs.

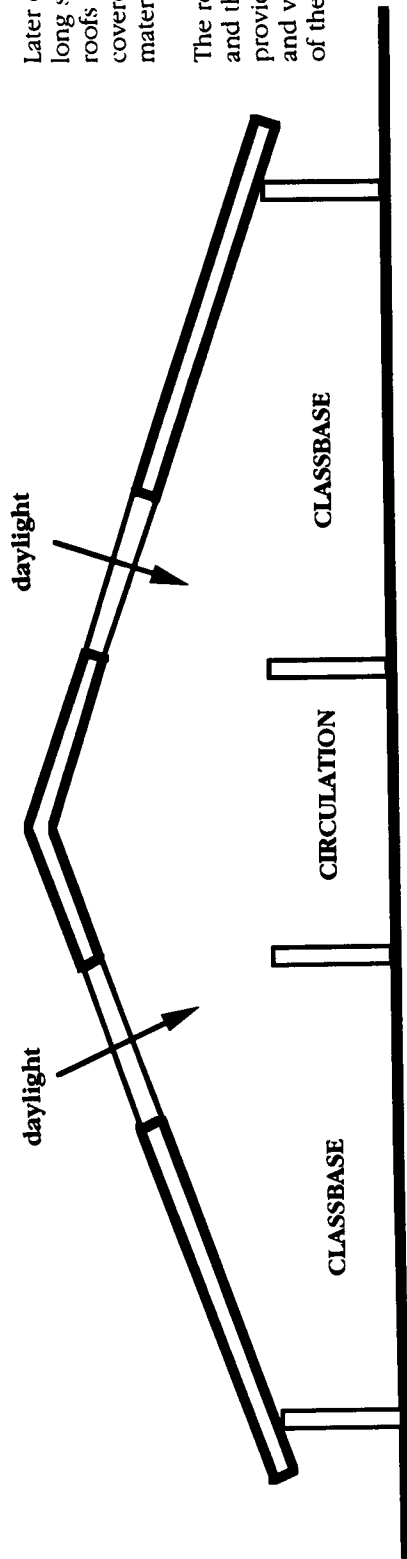
The pitched roof void was unused with a ceiling at normal flat roof height creating rather dark accommodation.



PITCHED ROOF USING HATS LINKED TOGETHER WITH FLAT ROOFS

Later designs had low pitch, long span, "Industrial shed" roofs over the whole plan covered with a sheet material.

The roof void was exposed and the volume used to provide natural daylight and ventilation to the centre of the plan.



PITCHED ROOF USING THE VOLUME FOR DAYLIGHTING

ILLUSTRATION D53 - PITCHED ROOFS
 Showing the evolution of pitched roofs following the demise of system building.

Users' views

It is interesting to note from the user survey that the schools constructed in MCB flat roof format were consistently marked down by their users over all questions, with the average level of satisfaction being below the overall average at 52% (French, C. P., 1995d). Caution should be exercised, however, when drawing conclusions from this lower rating because the average rating for the external image and fit with the neighbourhood was fairly high at 63%, and with over half of the schools fitting into the MCB or SEAC category, satisfaction levels concerning the appearance of their school could not have been particularly low and may relate to other issues or contradictory views amongst users.

6.8 SHORT LIFE STRUCTURES

Essex primary schools have, as previously explained, a large number of short life structures, often provided in response to a rapidly expanding pupil population and a need to spread diminishing resources as far as possible.

Timber framed systems

Essex County Council first became involved with timber framed buildings in the boom years of the 1950s and 1960s, when they were faced with a rapidly expanding school population following the demographic changes brought about by the Second World War, and more recent London over-spill into Essex. They literally could not build traditionally constructed schools fast enough to keep up with rising numbers of pupils, and were tempted by the factory built, timber framed, bolted together, wall panel and flat roof system buildings offered by companies such as Anderson's, Derwent and Secometric, which could be erected quickly and cheaply on a concrete base anywhere in Essex (French, C. P., 1995j).

Unfortunately, these buildings were only intended to have a relatively short life of 20 to 30 years, and often used poorly seasoned softwood framing and inadequate detailing of joints etc., and following many years of minimal maintenance, water penetrated the fabric, rotting windows, doors and structural posts. This has led to a situation where several schools have been demolished and replaced with permanent structures in brick and tile.

Other schools have been structurally propped with a new steel framework and reclad in aluminium or PVC curtain wall systems to give them a further 10 to 20 year life. (see illustration D54)

Demountables

As mentioned earlier the rapidly growing number of pupils and uncertainty over actual numbers at specific schools, led to the use of large quantities of temporary classrooms throughout Essex.

The earliest of the temporary classrooms were built of timber framed wall and roof panels which were bolted together, rather like an overgrown garden shed on a concrete base. If and when they were moved they had to be demounted into their component panels and re-erected on the new site and were known, therefore, as "demountables". This form of construction was relatively cheap to construct initially, but difficult and expensive to move, as it involved the breaking up of the old base and constructing a new one on the host site.

Relocatables

A new form of relocatable classroom was developed, therefore, using the factory construction methods used for mobile homes, with new classrooms split into three sections complete with floor, walls, roof, external cladding, windows, doors and internal finishes. These sections were small enough to be transported from the factory on the back of a lorry, and either slid or craned into position and bolted together. This type of classroom did not need a continuous floor and foundation, due to its framed construction and they were often sat on concrete pads or paving slabs with an air gap beneath. This made their subsequent removal very much easier, but access had to be via a stepped platform.



BEFORE RECLADDING
showing the rotting timber curtain walling.



AFTER RECLADDING
showing the new aluminium framed & insulated fibreglass panel
curtain walling.

**ILLUSTRATION D54 - MONKWICK COUNTY PRIMARY
SCHOOL, COLCHESTER. - RECLADDING OF FAILING
TIMBER STRUCTURE.**

Original
in colour

DISTRIBUTION

Essex County Council has one of the largest portfolios of relocatable classrooms in the country, with a total of 996 in June 1992, of which 622 were sited at primary schools (ECC Property Services Department, 1995).

Most of the primary schools (167) have only one or two relocatable classrooms on site, but an alarming number (90) have three, four or even five on site and permanent extensions at these schools are long overdue. (see illustration D55)

TYPES

The design of the relocatable classrooms has evolved throughout the study period from the glazed flat roof model of the early 1970s to today's highly insulated type.

Glazed Type

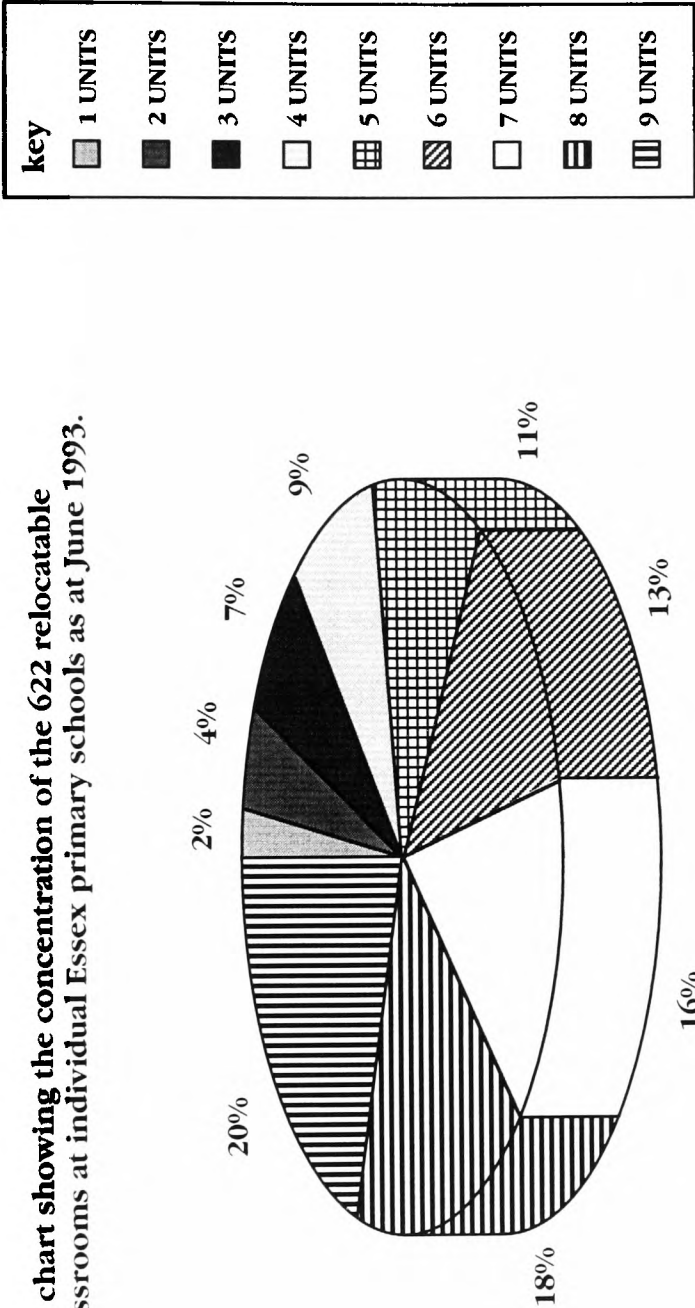
This model (see illustration D56a) was in use in the 1970s, was fully glazed on at least two sides, and tended to be hot in the summer and cold in the winter. Very few of the classrooms were provided with toilets or a practical area, but most had a cloakroom and small store.

Insulated Type

The energy crisis of the late 1970s caused by huge increases in the price of oil brought about a fundamental redesign of the relocatable classroom (see illustration D56a) and the insulation of external walls, roof and floor was dramatically increased. Windows sizes were also decreased in size to a "punch hole" design and made of maintenance free aluminium.

The external cladding was changed from stained softwood to a low maintenance textured plastic finish. Many more classrooms were also provided with toilets, and practical areas with sinks, as well as stores and cloakrooms.

Pie chart showing the concentration of the 622 relocatable classrooms at individual Essex primary schools as at June 1993.



Abstracted from list of Relocatable classrooms. (see ECC Property Services Dept, 1995)

ILLUSTRATION D55 - CONCENTRATION OF RELOCATABLE CLASSROOMS

Pitched Roof Type

The County Architect's Department also developed a pitched roof type, covered with look-a-like interlocking bold roll tiles in sheeting in response to pressure from the County Planner for use on more sensitive sites located near listed buildings or in conservation areas (see illustration D 56b). These classrooms proved to be much more expensive than the flat roof variety and the pitched roof had to be demounted when they were moved. Very few of these classrooms have been built.

Maintenance

The County Architect's Department's maintenance budget has been under considerable pressure during the last 10 years, and at one time all maintenance of relocatable classrooms was stopped on the basis that they were temporary structures. This led to a rapid deterioration in the condition of the classrooms, with many so bad that they could not be moved.

It was agreed, however, that the County Council would need a strategic reserve of classrooms to meet its statutory responsibilities for the foreseeable future. A number of the better classrooms were repaired, numbered and a list compiled of their location and condition, with a promise that they would be maintained to enable them to be moved to other sites with bulges in the school population. All other demountable and relocatable classrooms will be demolished or handed over to individual schools to maintain if they are not part of the strategic reserve.

The Education Department has been gradually standardising on a certain design of relocatable to build up a stock of classrooms, and the specification of new relocatable classrooms has also been improved to give them a longer life with less maintenance required.

Architecture

Unfortunately, although the relocatable classrooms are now of a higher standard they are still detached from other permanent facilities, and often of an alien architecture compared to the main school building.



RL3 OLD TYPE

highly glazed with little insulation giving a poor internal environment.



RL3 NEW TYPE

smaller windows, better insulation and lower maintenance.

**ILLUSTRATION D56a - DIFFERENT TYPES OF
RELOCATABLES USED AT ESSEX PRIMARY SCHOOLS**

Original
in colour



RL4T CLASSROOM WITH TOILETS
providing a "self contained " teaching environment.



RL4T PITCHED ROOF CLASSROOM WITH TOILETS
an expensive option which was not entirely successful.

**ILLUSTRATION D56b - DIFFERENT TYPES OF
RELOCATABLES USED AT ESSEX PRIMARY SCHOOLS**

Original
in colour

These rather tall flat roofed, plastic coated boxes raised above ground with stepped or ramped access and fire escape, also make an uncomfortable architectural neighbour to the traditional pitched roof Essex primary school with their brick and tile cladding. Some of the smaller schools with large number of relocatable classrooms, have, at times, appeared to be dwarfed by these surrounding boxes due to the rather high eaves line.

Ironically, despite their uncomfortable architecture, they have proved to be a remarkably flexible and cost efficient way of providing basic teaching space in a constantly changing world.

Users' views

Several head teachers remarked to me, on visits, that the classes in the relocatables appeared to be like "liners moored off shore", quite comfortable, but a little remote from the main school.

Many teachers like the contained nature of relocatable classrooms, but their detached siting means that children have to leave their accommodation to visit the hall, library and audio visual room for activities such as drama, music, watching television and reading, often having to put their coats on during the winter months or inclement weather, and many of the older types have a poor internal environment, without toilets or practical areas, being hot in summer and cold in winter.

6.9 CONCLUSIONS

The use of different construction systems has dramatically influenced the architecture of Essex primary schools during the last two decades by the following factors :-

- The continuation of building systems such as SEAC, with their structural frames and cladding panels, created a discipline based on a structural grid leading to simple repetitive plans.
- The use of flat roofs to cover these system buildings meant that plans could be deep clear span with natural lighting produced by means of clerestorey or roof lighting.

- The international style of architecture created by the lightweight systems reflected the hopes and aspirations of the nation following the War, and was generally accepted by the people of Essex.
- The decision to develop a heavyweight structural concrete panel system in Essex also had a dramatic effect on Essex school architecture. Plans became even more regular and deep with the most efficient configuration being a square as it used the least number of expensive external wall panels.
- The high cost of components induced designers to keep plans tight and areas low, with a consequential effect on the size of classrooms and circulation space.
- Open plan layouts were also fashionable at this time and the MCB frame gave clear spans which allowed partitions to be lightweight and moveable.
- The MCB wall panels, however, with their restricted choice of aggregate finish, parapet eaves and punch hole windows produced a hard architecture alien to the brick, tile slate and timber clad Essex vernacular, which was disliked by planners, teachers and general public alike.
- It is true to say that some architects produced a very good environment for teaching using MCB, but, unfortunately, this was the exception and most architects lost, or were unable to produce the "sense of place" necessary for a primary school to successfully serve its local community. Many people in the department also became preoccupied with the technicalities of system building at the expense of good design.
- It must be said, with hindsight, that given the reducing number of school pupils and school building in the mid 1970s it was a mistake to attempt to develop the MCB system of building just for Essex as there could never be sufficient demand to satisfy the cost of supplying the components.
- The demise of MCB brought its own problems, however, as designers who had stopped thinking about the form of their flat roof buildings had to relearn the relationship between plan and section, gradually producing

designs which were at first pitched roofs over flat roof plans, and later more exciting designs which made fruitful use of the volume naturally produced by the pitched roof.

- Changes in educational policy also produced layouts which were less open deep plan, and more sinuous narrow plan which had a dramatic effect on the relationships between the various component parts of the primary school. It also made the design of pitch roof buildings very much easier.
- The renaissance of pitched roof building forms has also led to more use of traditional Essex materials and a greater affection for these buildings by their users and the general public.
- Many observers have commented that most Essex primary schools built during the past 25 years have flat roofs but, although there was a period during the 1970s when this was almost the only roof form used, statistics show that just as many pitched roofs were built during this time.
- Essex County Council Education Department has built a tradition of short life buildings, starting with the timber framed schools of the 1950s and 1960s to today's relocatable classrooms.

The main justification for their continued use has been to cope with short term bulges in the school population, but numbers have risen to such an extent that they are now a permanent part of the school environment. Most of the relocatables are situated in ones and twos on small primary school sites but, an alarming number of schools have three or four often housing half of the school population for a number of years. Their replacement is now well overdue.

- It is also interesting to note that, despite the use of several different manufacturers, the basic design of the relocatable has not changed dramatically since 1973. The only real change to the flat roof, square box form has been the use of lower maintenance, better insulated cladding and smaller aluminium framed windows. The experiment with a more expensive pitched roof format has clearly not been successful.

- Children using relocatable classrooms will, however, always be at a disadvantage without access to support facilities such as the hall, library, etc., and many of the older types have a poor internal environment without toilets or practical areas being hot in summer and cold in winter.

The choice of construction system for the next generation of Essex primary schools will clearly be a major influence on their character and teaching environment. It seems unlikely that the school building programme will ever be able to support an industrialised system of building similar to SEAC or MCB again, although, the constant pressure to reduce the cost of new schools may see the introduction of simple steel or timber frame systems with customised cladding through the use of design and build procurement methods.

The main lesson of the recent past appears to be, that any future attempts to rationalise the primary school construction process must produce a human scale architecture with a form and materials suited to the county's vernacular if it is to be respected by the people of Essex.

Clearly, the legacy of short life structures in Essex is a testament to short term decision making and the County Council must husband its resources to replace relocatable classrooms as soon as possible before another generation is disadvantaged.

CHAPTER 7

AESTHETICS

7.1 INTRODUCTION

It is difficult to separate the various aspects of primary school design so as to comment solely upon its architecture. It is possible, however, to use the tried and tested Vitruvian principles of " Firmness, Commodity and Delight " to reveal those aspects which some would call aesthetics.

Commodity is a measure of how well the primary school building meets the brief in terms of the organisation of space and its layout, and this is covered in some depth in Chapters 5 and 12.

Firmness is a measure of how well the spatial requirements have been enclosed by a structure which protects the teaching activities from the elements, and this is covered in some detail in Chapters 6 and 8.

A successful primary school design must satisfy the basic requirements of commodity and firmness if the educational process is to flourish within its portals, but for such a building to raise the spirits of its users as true architecture, it must also possess delight.

This Chapter will attempt to analyse some of the aspects of Essex primary school design since 1973 which have contributed towards a sense of delight amongst users, including the role of the architect, sense of place, character, form and materials.

It will also try to draw conclusions from the study of the different styles of architecture in use throughout this period, to identify a successful formula for the future.

7.2 THE ROLE OF THE ARCHITECT

Any discussion about the aesthetics of primary school design must include an appraisal of the role of the architect as principal designer.

Background

Much has been written about the role of the architect since his emergence during the middle of the Eighteenth century and I will not repeat it in this thesis

(Saint, A., 1983). It is necessary, however, to appreciate the role played by architects in the design of public buildings and the aesthetics of schools in particular.

The architect introduced the concept of style into the design of public buildings, as before their involvement most buildings were designed by master craftsmen using the materials and forms of their locality (vernacular).

The battle of the styles for public buildings has raged for years, with many Victorian architects claiming the only appropriate style for churches and their offspring schools was Gothic revival, whereas, others claimed they should be designed in a classic Roman or Greek revival style befitting their importance as public buildings.

The introduction of the Modern Movement in the 1930s and its subsequent development through the work of architects like Corbusier, Mies Van de Rohe, and the Smithsons set the scene for current architectural thinking, but the battle continues as the British public retreat into a nostalgic revival.

Essex County Architects

The County Architect's Department of Essex in 1973 was typical of most Shire Counties with a varied staff of qualified architects, unqualified assistants and technicians. The County Architect at this time was happy with this mixture with most designers expected to produce system buildings according to the dictats of the County Architect. The arrival of Alan Willis saw a change in staff structure to the current policy of employing qualified staff only who are given considerable professional freedom without a strong departmental design policy.

System building

The use of system building for a large proportion of school buildings in the 1970s had a marked effect on their aesthetics as architects struggled with a limited palette of materials and building forms, often stifling the use of their full range of design skills.

The use of a system building brought about a certain discipline of design, however, which was undoubtedly a design leveller raising the quality of the

poorest designer, but constraining the more able. To quote the metaphor of language used by one of the departments more talented designers, "... using the MCB system allowed designers to produce fairly good prose but seldom produced poetry" (French, C. P., 1996).

Renaissance of design

The last decade has seen the abandonment of uneconomic system building and a renaissance of good, stimulating primary school design following the lead set by pioneering local Authorities like Hampshire County Council under the leadership of Colin Stansfield-Smith.

Essex architects freed from the system building yoke have risen to this challenge producing many exciting new primary schools in a variety of styles. These have tended to follow rather than set the fashion of the day, however, with several reinterpretations and copies of award winning schemes.

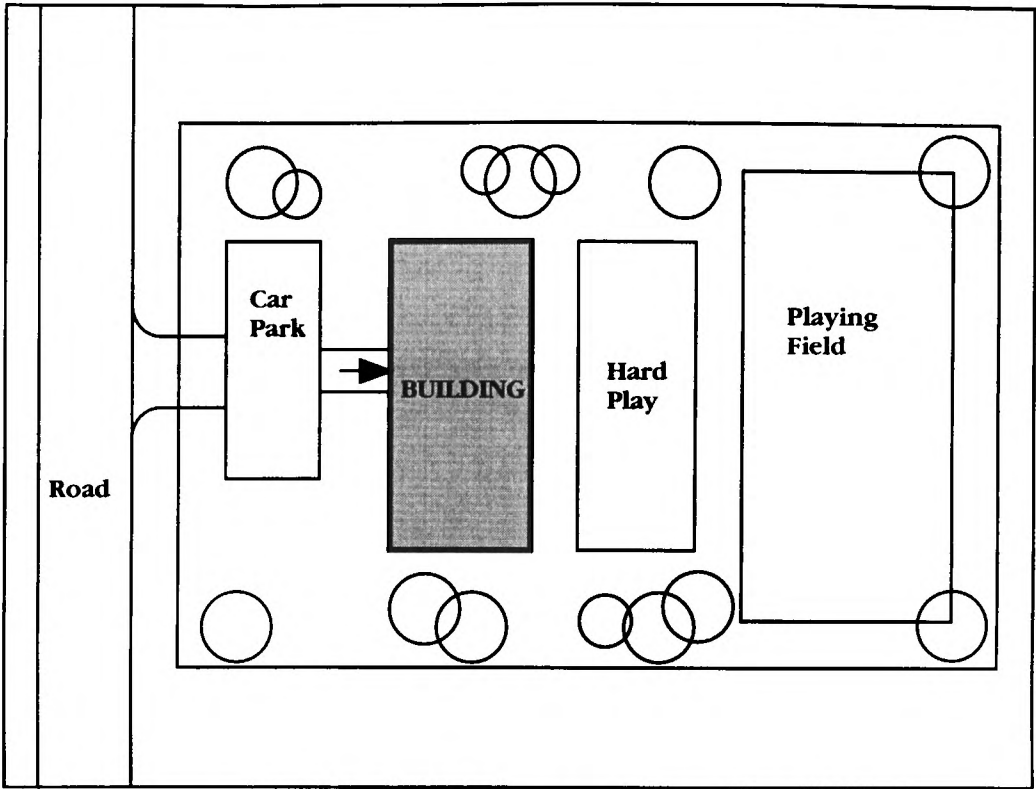
Unfortunately, this free-for-all has resulted in most architects 'doing their own thing' with very little attempt at learning from precedent or consolidating proven design.

7.3 SENSE OF PLACE

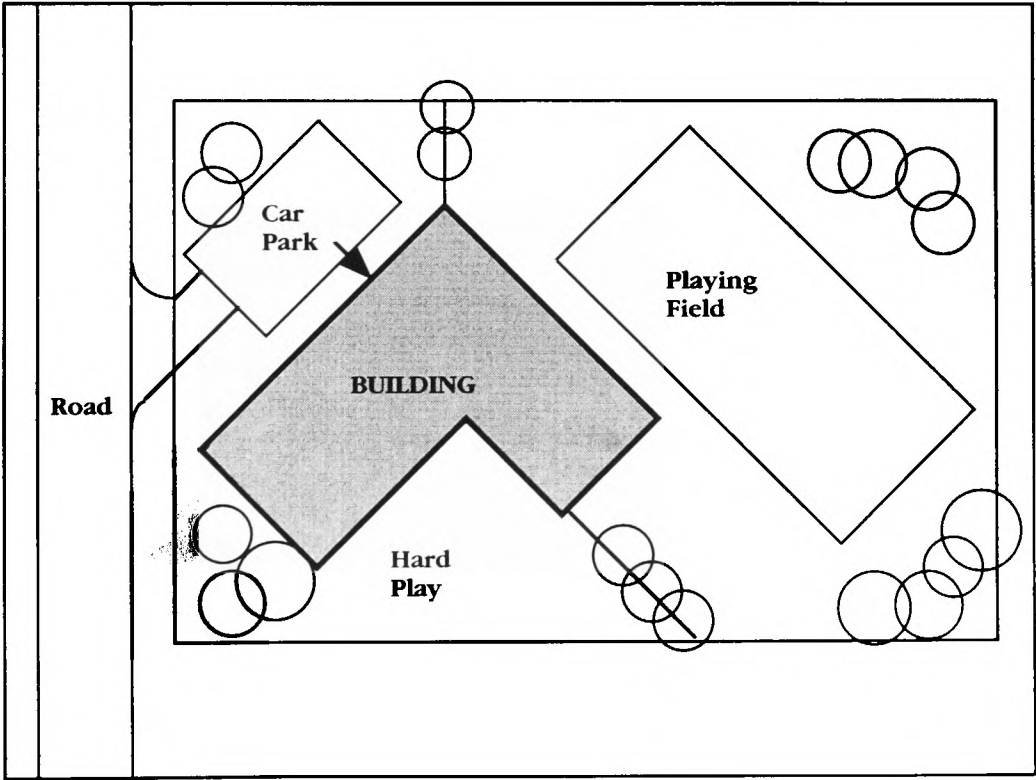
Many teachers and parents have remarked during visits to Essex primary schools, particularly those in suburban areas, that their site is anonymous and lacks any sense of place (French, C. P., 1994m). Some of this lack of place can be related to the style of building, particularly the MCB structures, but much is also related to the character of the site on which the school stands.

Shape

Many primary school sites are on the perimeter of towns, and were purchased cheaply as farm land was developed into new housing estates with bland rectangular boundaries. This blandness has often been exacerbated by placing the new school building on the site in the most economical fashion, without any attempt to enclose space to afford shelter for outside activities or create a sense of place. (see illustration D57)



**TYPICAL 'SQUARE' BUILDING POSITIONED CENTRALLY
WITHOUT ANY SENSE OF ENCLOSURE**



**IMAGINATIVE BUILDING SHAPE AND POSITION
CREATING ENCLOSED 'PLACES'**

ILLUSTRATION D57 - POSITION OF BUILDINGS ON SITE

Slope

The majority of Essex primary school sites are also flat, with very little fall to enable interesting changes of level to be created. It must be said, however, that the few sites which have significant slopes have also created difficulties with cut and fill playing fields and access for disabled pupils.

Existing features

Many Essex sites are also devoid of any existing features such as water courses, belts of mature trees, mounds or changes of level. Unfortunately, some sites which have had these features have lost them during development in the past, to provide a more economic site layout or even seen their removal after the school was built to reduce maintenance costs.

The protection and enhancement of existing landscape features is an important aid to reducing the raw appearance of new development and will help any new school to settle into the surrounding environment.

Boundaries

Boundary treatment is discussed in detail in Chapter 10, but it is fair to say that the insensitive use of chain link fencing to mark the boundary of almost all the primary schools built over the last 25 years, has been a major contributor to their institutional appearance.

Successful boundary treatment should reflect the area in which the school is located for instance, with walls in urban areas, palings in suburban areas and hedges in rural areas.

7.4 CHARACTER

It is possible to divide the new primary schools built in Essex since 1973 into three distinctive styles or character :-

- Lightweight system building such as SEAC and some timber framed systems,

- Heavyweight systems such as MCB,
- Traditional pitched roof buildings,

and these styles have enjoyed the affection or disapproval of Essex people for a variety of reasons.

Local Environment

Designers of Essex primary schools have generally fallen into two factions:-

- Those who believe that every new school should respect its setting, and adopt a character or style which helps it merge into its surroundings, and
- Those who believe that a well designed primary school with a character which reflects its function and the era in which it is built can be made to fit any site.

Each approach can produce a successful design providing the designer exercises their skill in a clear and logical fashion.

Genius loci

Students at the school of architecture I attended were taught that they should attempt to identify the genius loci surrounding the site of every new building, by isolating and defining the essence of what makes that particular place unique. They were also encouraged to use this analysis as one of the primary pressures, along with its function to determine its character.

I have not been able to detect any of this thought process in the primary schools built during the past 25 years, apart from some notable examples, such as Newlands Spring primary school in Chelmsford which reflects the character of the surrounding housing. It must be acknowledged, however, that some of the suburban and new town settings for these schools create very little inspiration in this direction.

Essex Vernacular

It is undoubtedly true that if asked most teachers, parents and pupils would express a preference for schools built of traditional materials which they would describe as "Vernacular", but it is doubtful if such an all embracing style exists.

The County Planner's Environmental Service Branch, authors of the Essex Design Guide, clearly think there is such a style, and it can be defined by reference to the forms and materials of the past.

They have publicly stated (Aspinall, A., 1995) that a primary school constructed of brick, tile, slate, render or timber boarding with steeply pitched roofs over a narrow span with gable ends and bay windows will produce a vernacular style building suitable for most sites. They also state that a school vernacular based upon Victorian/Georgian also exists which makes the perfect role model for Essex primary schools

It is probably better to recognise, however, that every part of Essex has its own particular vernacular style, from the seaside architecture of Clacton and Southend, Roman Colchester, the new towns of Harlow and Basildon to the villages of the Essex/Suffolk, Hertfordshire and Cambridgeshire borders and each should relate to its own particular *genius loci*.

Fashion

Essex primary school design has, like most public building throughout Great Britain, followed the fashion of the day.

After the Second World War there was a sense of renewal throughout the country and a new style of architecture was sought to express the hopes for the future. The lightweight clad system buildings, such as SEAC and some timber framed systems developed for school building, responded to this mood by adopting the Modern Movement or International style as their role model, producing flat roofed, clean cut, undecorated buildings reminiscent of Bauhaus architecture suitable for the machine age. (see illustration D58)

These schools, although not as renown as their Hertfordshire counterparts, were accepted by Essex people living in the rapidly growing suburbs and new towns,



OAKLANDS PRIMARY SCHOOL, CHELMSFORD -
The International style which reflected the aspirations of Essex people



CANN HALL MCB PRIMARY SCHOOL, CLACTON -
A style reviled by Essex residents

Original
in Colour

as a suitable response to the spirit of the time with their industrialised systems responding to the pressures of growth.

The attempt by the County Architect in the 1970s to develop a heavyweight system in a modern style failed to inspire the ordinary people of Essex, who gradually began to despise these mean-spirited flat roof concrete boxes in their midst, and hankered after the red brick tiled pitch roof Victorian schools of their childhood. (see illustration D58)

This disaffection with modern architecture and nostalgic love of forms and materials from the past has, of course, become a national obsession, and most Essex primary schools built in the last ten years have followed the fashion. The majority have been built of traditional load bearing construction, although the need for a deep plan form has meant that they have taken the agricultural barn or Victorian factory as their role model, rather than the Victorian or Edwardian school as the planners would wish.

7.5 FORM

The form of most Essex primary schools constructed since 1973 has been determined by their function, with deep open plan layouts needing either contiguous flat roofs to cover them efficiently, pitched roof pavilions joined with flat roof links, or large low pitch roofs covering the entire plan.

Number of storeys

Parts of urban Essex, especially Southend, have many multi-storey primary schools, due to their constricted sites, mainly built in the late Victorian or Edwardian period.

This tradition was followed in the 1960s with the construction of several proprietary timber framed system, two storey primary schools, and a few SEAC two-storey schools, making efficient use of their framed structures.

Essex primary schools have, however, generally been single storey since 1973, mainly because the MCB system was devised as a single-storey method of construction, and partly because the primary education system needed easy access to the outside direct from the classrooms.

The increase in the number of physically disabled children now being taught in main stream education means that two-storey solutions, with expensive lifts, are not really an option within current budget levels.

A few split level schools were also constructed to make use of a sloping site, or better use of the roof void within a large span pitched roof such as Ryevale primary school in Basildon. (see illustration D59)

Scale

Most designers would agree that the scale of a primary school should be appropriate to the size of the pupils who predominantly use it, but they often disagree about how this should be interpreted.

Some designers have attempted to reduce the scale of their buildings by reducing eaves and ceiling heights, such as Great Waltham and Stanway primary school halls, but this is often criticised by adult-height teachers who also have to work in the buildings, as claustrophobic. (see illustration D60)

Other designers faced with the problem of putting a pitched roof over a large span have been prepared to leave the roof void open, as at Highwoods and Shelley primary schools, on the basis that such a space can add excitement to the school environment, as well as helping with daylighting and ventilation. (see illustration D60)

It is certainly true that certain details of the building need to be child scale with the heights of window cills, vision panels and display boards being at child, not adult eye level. It is also true that the heights of external features such as eaves, parapets, and screen walls need to be at an appropriate height for the users, as tall walls and parapets can produce an intimidating and hostile environment for children.

The exceptional height of the MCB concrete panel with its parapet is undoubtedly one reason why pupils, parents and teachers felt the system produced an uncomfortable architecture.



SPLIT LEVEL DESIGN AT RYEDENE PRIMARY SCHOOL, BASILDON.

ILLUSTRATION - D59 EXAMPLE OF A SPLIT LEVEL PRIMARY SCHOOL
Showing the change of level and use of roof void.



CHILD SCALE DESIGN AT GREAT WALTHAM PRIMARY SCHOOL.



**DESIGN WITH AN 'INSPIRING' SCALE AT
HIGHWOODS PRIMARY SCHOOL, COLCHESTER.**

Original
in Colour

ILLUSTRATION D60 - EXAMPLES OF SCALE
Showing different interpretations of an appropriate scale for primary schools

Massing

Most designers would agree that primary schools should have variation within their height and volume to provide an interesting external and internal appearance, if they are to provide a stimulating architectural experience for the users of the building.

This variation in massing can also be used to stress the importance of certain features, such as the hall, which is traditionally the largest mass and centre of the school community, or by carefully placing two separate masses together to introduce a visual tension between them, which can produce a natural entrance point into the building.

The traditional Victorian or Edwardian primary schools with their pitched roofs and gable ends developed a natural massing related to a hierarchy of space over many years with more dominant roofs over halls than classrooms. Designers who have attempted to copy this massing in new schools and extensions have discovered, however, that the larger classbases in today's primary school produce greater volumes, and it is difficult to achieve the desired hierarchy. (see illustration D61)

The flat roof parapetted system buildings of SEAC and MCB have none of the traditional subtlety of massing, and the impact of the large mass of the hall is often lost when buried in the centre of the plan, and it can hardly be seen above the continuous parapet of the external walls as at Elmstead Primary School. Attempts were made, however, by designers to provide the hall as a separate higher pavilion where it was able to add to the architectural composition, as at Roachvale primary school in Colchester. (see illustration D61)

Proportion

Many of the county's older primary schools built in traditional format also have a style which follows classical proportions related to the human scale, with windows, doors, gable ends and bay windows of a comfortable size and shape.

Unfortunately, the development of the SEAC and MCB systems with their standard components reduced designers' appreciation of the importance of



TRADITIONAL MASSING AT ELSENHAM PRIMARY SCHOOL.



DESIGN WITH A MASSING RELATED TO FUNCTION AT ROACHVALE PRIMARY SCHOOL, COLCHESTER.

ILLUSTRATION D61 - EXAMPLES OF MASSING

Original
in Colour

proportion and window and door components were often assembled into over-large elements of uncomfortable proportions. (see illustration D62)

Although most designers have now adopted more traditional materials and forms, there is still a tendency to forget the importance of proportion and repeat the mistakes of out-of-scale system building.

Perimeter Treatment

The importance of the perimeter of the primary school building, and the transition from inside to outside will be discussed in detail in Chapter 10, but a successful design should have sufficient re-entrants to provide sheltered outside teaching spaces and steps, ramps, walls, pergolas and covered areas to merge the boundary between inside and outside.

Unfortunately, the economies of the MCB system with its expensive wall panels, encouraged designers to produce a simple square box with as few panels as possible and many schools, as a consequence, have an abrupt junction between inside and outside.

Some designers attempted to manipulate the external wall with expensive re-entrants or bay windows whereas others accepted the discipline of the system and simplified the building envelope to such an extent that they could afford extensive external works which softened the inside/outside interface, as demonstrated by Barnes Farm junior school in Chelmsford. (see illustration D63)

Roof

The importance of the roof on construction systems has been discussed in detail in Chapter 6, but it also has a dramatic effect on the form and character of the primary school. The two main styles of building used to construct Essex schools over the last 25 years have been dominated by their roofs.

The traditional Victorian or Edwardian school building usually has a steeply pitched church like roof covered with slates or tiles, and this has been reinterpreted into a low pitch roof for use on modern large span structure, to



**MCB BAY WINDOW AT CANN HALL
PRIMARY SCHOOL, CLACTON.**

Original
in Colour

**ILLUSTRATION D62 - EXAMPLE OF POORLY
PROPORTIONED MCB COMPONENT**

Original
in Colour



EXTERNAL WORKS AT BARNES FARM JUNIOR SCHOOL, CHELMSFORD.

**ILLUSTRATION D63 - EXAMPLE OF THE SOFTENING EFFECT
OF EXTERNAL WORKS AT AN 'ECONOMIC' MCB JUNIOR SCHOOL**

avoid huge roof voids, covered with interlocking clay or concrete pantiles, or profiled metal sheeting reminiscent of industrial or agricultural structures.

Many of the pitched roofs had open roof voids which added to the volume of classrooms and halls, and more recent industrial shed structures such as Barnes Farm primary school also allow the roof void to be used in this way. (see illustration D64)

The system buildings of the 1970s and 1980s had flat roofs, covered with asphalt and without eaves, which could not be seen from outside the building, and contributed very little to the character of the building.

Solid and void

The proportion of solid and void in the external elevations to Essex primary schools has changed dramatically over the last 25 years and this has affected the form and character of these schools.

Victorian and Edwardian schools had large, well proportioned areas of window, and clerestorey glazing which produced a restful balance of solid and void as well as light and airy interiors.

The lightweight SEAC system buildings of the late 1960s and early 1970s were also designed to have good natural daylighting (minimum 4% daylight factor), and had such large areas of glass in their facade that it made sense to turn entire elevations into curtain walls with solid panel infill where windows or doors were not required.

The heavier weight MCB which followed attempted to reduce heat loss in winter and heat gain in summer and reverted to small windows either punched into the centre of panels or fitted between panels in a lighter weight structure. Unfortunately, although more energy efficient, the interiors of these schools are dark and gloomy and the exterior rather austere.

More recent, traditional styled buildings, have increased the amount of natural daylighting to give a more balanced design similar to the Victorian precedent. Large areas of patent glazing on roofs and more double glazed window area in walls, have become the norm, creating light and airy interiors once again.

Original
in Colour



OPEN ROOF VOID AT BARNES FARM INFANT SCHOOL, CHELMSFORD.

ILLUSTRATION D64 - EXAMPLE OF AN OPEN ROOF VOID
Showing the affect on volume and lighting

7.6 MATERIALS

The choice of external materials for Essex primary schools has been a major element in their success or failure, either introducing warmth and human scale to facades, or rendering them cold and hostile.

Walls

Brick has been used extensively throughout Essex for factories, agricultural buildings, public buildings and housing. Invariably this brick has been made from local clay which produces a soft red brick with an orange emphasis, known as the "Essex Red".

A few extensions to Victorian or Edwardian schools have been constructed in Essex Reds, but generally bricks from all over Great Britain and even Europe have been used, including sand faced, engineering and stock bricks. Although not indigenous, many building users have expressed a liking for these bricks with their human scale/module and variation in colour and texture.

Rendering is also a vernacular material of Essex, mainly used in the villages along the Essex/Suffolk, Cambridge and Hertfordshire borders. There is also a tradition of decorative work in plaster known as pargetting, using wooden moulds which are pressed into the wet render, particularly prevalent around Saffron Walden. Rendering has not been used on many Essex primary schools, due to its poor weathering and cracking tendencies, apart from one or two well known exceptions, such as St. Peters at Coggeshall and Ravenscroft in Clacton.

Essex also has a tradition of black weatherboarding on its farm buildings and one or two primary schools have used areas of vertical tiling or boarding on some walls as a relief panel, but these have a high maintenance liability and their use has been discouraged.

The lightweight SEAC system was available with a large range of panel materials for fixing into the curtain walling, including ETERNIT and GLASOL with "enamelled" surfaces, as well as the more traditional vertical tiling and boarding.

The MCB panels were originally produced in a striated natural grey concrete finish, but were so disliked by designers and planners other finishes such as Norfolk flint and Cotswold stone were also produced which had a warmer colour and texture.

Roofs

The choice of material for the roof has a dramatic effect upon its appearance, particularly its colour and texture.

Most of the system buildings had flat roofs covered with asphalt, although MCB also had a pea shingle covering. As these roofs were largely unseen the colour and texture was unimportant.

Traditional pitched roofs have generally been of 45 degrees or more and covered with plain clay tiles or Welsh slates, although some recent traditional pitched roofs have also been covered with one of the many replica slates on the market.

The large span pitched roofs over industrial shed structures have generally had a lower pitch of 20-30 degrees, and have been covered with interlocking concrete tiles, clay pantiles or profiled metal sheet. The planners have objected recently, however, to some of the lighter coloured profiled sheet which, they maintain, is alien in the Essex environment.

Windows and doors

Traditional Victorian or Edwardian primary schools have painted softwood sash windows and ledged and braced doors, but the system buildings introduced in the 1960s abandoned timber in favour of mass produced metal window and door frames. SEAC used entirely standard galvanised steel windows and doors, often in a curtain wall system, whereas MCB used glass glazed directly into rebates in the concrete panel using gaskets, aluminium top hung sashes with rounded corners fixed into punched holes or aluminium sliding sashes mounted in storey-height timber panels fitted between the concrete panels.

More recent traditional styles of building have used powder-coated aluminium, stained softwood, or hardwood windows and doors in a variety of top-hung casements, side-hung casements, and vertical sliding sashes. (see illustration D65)

Many designers, and the planners, have been nervous about the use of colour on the outside of primary schools often using browns, olives and greys, even though pupils appear to like the use of strong colours. The strong primary colours have usually been restricted to ironmongery or sometimes the external doors, often adding sparkle to an otherwise drab facade.

External floorscape

The use of pavings is discussed in detail in Chapter 10, but it should be stressed that the choice of floor finish can have a dramatic effect on the character of a building, as the many uninteresting Essex primary schools surrounded with black asphalt, bear witness.

7.7 CONCLUSIONS

The consideration of primary school aesthetics in Essex reveals certain principles which if applied to future designs should produce an architecture which will delight its users and surrounding community :-

- Every primary school design should achieve firmness and commodity within its design to ensure the school can operate efficiently, but it also needs to delight its users and raise their spirits on every visit.
- The use of system buildings was a design leveller which ensured that the average designer would produce an acceptable product. Great care is needed in the present architectural free-for-all to ensure the less talented designer is properly supervised to ensure their product is not below standard.
- It is important to make the right strategic decisions when placing the new school on the site, to create interesting, sheltered external spaces which will add character to the building design.



**WINDOWS AND DOORS AT NABBOTTS
JUNIOR SCHOOL SCHOOL, CHELMSFORD.**



**WINDOWS AND DOORS AT HIGHWOODS PRIMARY
SCHOOL, COLCHESTER.**

Original
in Colour

- Every effort should be made to keep and enhance existing landscape features on site.
- Every new or extended primary school should respect its environment and design teams should attempt to define the prevailing character of the area before deciding how much this should affect the style of the new building.
- Designers should recognise that primary school design is subject to the same pressures of fashion as any other art form and not follow this fashion slavishly if it is not appropriate for a particular site.
- Every primary school should have an appropriate child size scale, without producing a building which is claustrophobic to adults or misses the opportunities presented through the use of large scale spaces such as halls and atria to produce exciting environments for the users.
- Primary schools should present an interesting and varied internal and external massing which can be used to emphasise the function of its different parts and entrances, as well as creating a stimulating visual experience as pupils, teachers and visitors move around the building.
- The external facades of the primary school, and their component parts, should have a human scale based upon the tried and tested principles of classical buildings from our architectural history, even if the style of the building is clearly modern. This should not prevent the use of modern technology to provide stimulating solutions, however, which look forward to the twenty first century and keep in step with the technology being introduced into the classroom.
- Most primary school users will prefer pitched roofs on their school, but the scale and function of today's school will mean that this is likely to be a large span, low pitch roof rather than the steeply pitched, short span roofs of the past.
- The materials chosen for roofs, walls, windows, doors and external works need to have a human scale with warm colours and interesting textures if the building is to be treated with affection by its users.

Clearly some of these principles have not always been applied to Essex primary schools during the last 25 years and some of the system built MCB schools have been disliked by their users, but a new architectural confidence is emerging in school design in Essex which hopefully will avoid the errors of the past.

CHAPTER 8

ENVIRONMENTAL DESIGN AND ENGINEERING SERVICES

8.1 INTRODUCTION

Essex Property Services Department has built a reputation in the field of Environmental Design and Energy conservation in the public sector during the past 25 years, and is considered by many to be at the cutting edge of such development.

Inevitably, much of this development work has been carried out during the design of primary schools which made up a significant proportion of the department's workload since 1973. It is also clear from interviews with the teaching staff of Essex primary schools, that comfort conditions within their establishment is of prime importance to the teaching and learning environment.

This Chapter will examine past developments in the field of environmental design and the engineering services needed to sustain comfort and safety. It will also attempt to comment on the relative success and failure of the various environmental initiatives taken by the County Architect's Department over the last 25 years to establish if there are lessons which can be applied to future primary school design.

8.2 A SHORT HISTORY OF ENVIRONMENTAL DESIGN IN ESSEX

Examination of the development projects described in detail in Chapter 4 demonstrates the importance placed on environmental design since 1973, with a clear pattern of experimentation and development in this field.

Much of this emphasis has stemmed from external pressures such as the oil crisis, economic circumstances and more recently a growing concern for the Earth's global environment. The particular interest environmental design in Essex also has much to do with the particular enthusiasms of individuals within the County Architect's Department and how they interacted with each other.

It is often unwise to dwell too much on personality traits in a thesis of this kind, but the contribution of certain individuals to this field of activity is so significant that it is impossible to ignore their influence.

The first personality with a particular interest in environmental design was Ralph Crowe, County Architect from 1966 to 1976, who recognised the poor

environmental performance of the lightweight system buildings such as SEAC in use at this time, which overheated in summer and underheated in winter. Considerable time and resources were spent developing a new heavyweight system called MCB which was aimed at rectifying these problems by increasing the insulation standards of the external envelope and damping violent swings in temperature.

Ralph Crowe appointed an Assistant County Architect, Peter Page who was also committed to good environmental performance and multi-discipline design. He employed the first environmental engineer and energy manager and helped to develop the TAS computer modelling programme, as well as encouraging links with academic institutions such as Cranfield Institute of Technology and Cambridge University's Martin Centre with a particular interest in the environment.

The present County Architect, Alan Willis appointed in 1976, is also a strong supporter of good environmental design and multi-disciplinary team work, and has encouraged the development group lead by Barrie Page to continue with the environmental emphasis of development projects.

The department has had several enthusiastic energy managers including Ken Spiers, Chris Breem and David Curtis, who employed talented environmental engineers such as Brian King and Gordon Powell to work with design teams to improve the performance of primary schools. They put energy conservation at the forefront of the department's agenda, but some designers would undoubtedly say, with the benefit of hindsight, that this was done at the expense of equally important issues such as the quality of architecture, and became overbearing at times.

Most of the Chief Engineers during this period including Philip Brown, Roy Hough, John Sleight and Norman Bishop have not shared this enthusiasm for environmental experimentation and multi-disciplinary design, however, preferring to stick to more traditional engineering values and avoid gambling with new untested systems and techniques.

It is fair to say that there has always been some antipathy between the environmental and services engineers as explained in Chapter 4 and although

they worked well together on the hand picked development team projects they had very little impact on the majority of primary school designs.

8.3 BALANCING CONFLICTING PRESSURES

The environmental design of Essex primary schools has not been straightforward, and has in many ways been a constant battle between conflicting demands, with design teams having to achieve a reasonable balance between environmental factors and other aspects of the design such as the educational brief, architectural style and budget.

Strategic Design

The County Architect's Department has had environmental engineers with access to a fairly sophisticated computer generated modelling programme able to predict the consequences of basic design decisions at the earliest strategic stage. Unfortunately, as mentioned earlier, the environmental engineers were not brought into the team for most primary school designs until too late, and then often only to advise on how the design could be modified to meet the requirements of DES design note 17. Most strategic design decisions were made by the architect or services engineer using tried and tested rules of thumb. Many of these decisions proved to be correct, but they were not based on any scientific data and design teams often failed to understand the correct balance between conflicting environmental factors. This made later changes to the design unpredictable and environmental problems such as underlit classrooms, a noisy teaching environment, poor ventilation and over and underheating came as a surprise when the new building was occupied.

This is well illustrated by two experimental team building sessions held at the Cranfield Institute of Technology aimed at improving strategic planning for two new primary schools. (CIBSE/ASHRAE, 1996)

The first session, in 1993, involved a multi-disciplinary design team including the client led by the department's own development group, designing a school for an area of new housing at Church Langley in Harlow who, after some initial disposing of inbuilt prejudices, worked through several different scenarios together using the computer generated prediction tools. The result of the

session was a naturally lit solar passive design with a mainly southerly aspect, but the team had discovered that the main environmental problem could be overheating during summer and this was addressed by use of a heavyweight concrete roof and high level night time ventilation. Despite many changes made to the design as the detail evolved these features remain and the school is under construction.

Conversely, the other session in 1995 involving a team from W.S.Atkins designing a new primary school at Marks Farm, Braintree was less successful. The team resented the time spent at Cranfield working through strategic scenarios and never gelled together because of the traditional insular roles played by individual members of the team. Despite these difficulties they developed a solar passive design which also had the potential to overheat in summer. They introduced a displacement diffuser system into the suspended concrete floor to cope with this problem by natural cooling, but clearly the commitment to this solution by the client and design team was not absolute as this feature has been omitted as part of a cost-cutting exercise recently and no doubt the school environment will suffer in hot weather as a consequence.

Insulation Versus Natural Daylight

Areas of glazing have varied throughout the period as design teams have attempted to balance the need for good natural daylighting against the need to improve insulation levels of external walls and roofs by avoiding the use of large areas of glass. It is undoubtedly true that most SEAC schools were over-glazed and some MCB schools designed during the energy crisis were under-glazed, but many of the traditional pitched roof schools which immediately followed MCB, were also under-glazed. The over-concentration on reducing areas of glazing to reduce energy consumption produced dingy schools and designers have only recently started to understand the true effect of such a decision on a scientific basis and are now able to strike a better balance between levels of daylight and thermal insulation.

Heat loss versus good ventilation

The amount of ventilation in Essex primary schools has also varied since 1973 as design teams have attempted to reduce the amount of heat lost through ventilation. It is true that over-zealous design teams reduced the number of air

changes in some MCB primary schools to unacceptable levels in an attempt to control heat loss, and these schools are now thought to be rather stuffy and unhealthy. Examination of such losses on a scientific basis would have revealed that such losses are marginal, however, and concentrating on uncontrolled ventilation is more fruitful.

Lightweight versus heavyweight structure

The SEAC primary schools of the 1960s and early 1970s had a poorly insulated lightweight structure which responded very quickly to external weather conditions, overheating in summer and underheating in winter. The heavier weight structure of the MCB schools successfully moderated external weather conditions and evened out swings in temperature gradient by the flywheel effect of the heavy structure, absorbing heat during the day and releasing it slowly at night when temperatures are lower in summer and when the heating is switched off during winter. (See Illustration D77).

Unfortunately, although recent designs have heavyweight floors and walls, they usually have lightweight roofs and much of the walls and floor is effectively insulated by carpets and pinboard. Insulation levels in modern primary schools are so good that the main problem is to avoid overheating at certain times of the day and year. Fortunately many of these designs also have a large volume, with high ceilings in classbases and halls, which can be used to avoid the worst effects of overheating by trapping warm air at high level through stratification and then vitiating it through the stack effect ventilation afforded by high and low level opening lights.

Orientation and solar gain

Design teams have also struggled with the advantages and disadvantages of solar gain at certain times of the year depending on the orientation of classbases. Southerly facing classbases can make use of solar gain during the winter, helping to reduce heating levels, fuel and energy, but the same heat gain during the summer can cause classbases to overheat and become uncomfortable for long periods of the school day, and careful shading of such glazing is required together with good natural controllable ventilation.

Prediction techniques

The County Architect's and Property Services Department's environmental engineers have been attempting to work with design teams to keep these various factors in balance, by using computer based performance predictors such as TAS which can demonstrate the dynamic effect of different scenarios at the strategic design stage including changes of fenestration, orientation and levels of insulation throughout the day and at different times of the year. Unfortunately, their influence has been marginal and many design teams still operate on an intuitive basis, and we have been fortunate that in most cases this still produces a building with an acceptable environment.

Correct balance

It is not possible to promulgate the perfect solution to these many conflicting pressures, and design teams must be encouraged to work through the effect of strategic design decisions together on a proper scientific basis, to arrive at a series of compromises which will achieve an acceptable internal environment for the school users throughout the year.

They may well find as the design progresses that some environmental performance has to be sacrificed to other aspects of the design such as operational requirements of the educational process or form and character of the building, but with a proper understanding of the consequences, the necessary value judgements can be made.

8.4 ENERGY CONSERVATION

The early 1970s saw the first stirrings of concern about the cost of heating badly insulated buildings, and the poor environment caused by underheating in winter and overheating in summer.

These concerns were brought into sharp focus by the oil crisis of the mid 1970s when the world's major oil producers, mainly in the Middle East, decided to reduce production which forced the price of oil to rocket, with a subsequent re-examination by building designers of insulation levels and choice of fuel source for heating.

In response to these pressures the County Council adopted a new energy conservation policy aimed at reducing the amount of fuel it consumed and it, therefore, set aside funds annually to improve insulation levels and heating controls in existing buildings, particularly primary schools. (See Illustration D69).

The County Architect's Department also appointed its first Energy Manager with a staff of fuel efficiency officers, environmental engineers and tariff officers. The energy conservation programme consisted of many different strands all aimed at reducing fuel bills.

Glazing

Areas of glazing to new buildings were targeted as potential sources of heat loss and were substantially reduced below the current norm from 50% to 20% of the area of external walls, and rooflights all but disappeared from designs. This, of course, had a dramatic effect on daylighting levels which fell well below the 2% DES minimum of that period. It also had the effect of increasing the use of artificial lighting systems in primary schools, however, and the energy saved by reducing heat loss through windows had to be balanced against the increased energy used in artificial lighting (see illustration D66).

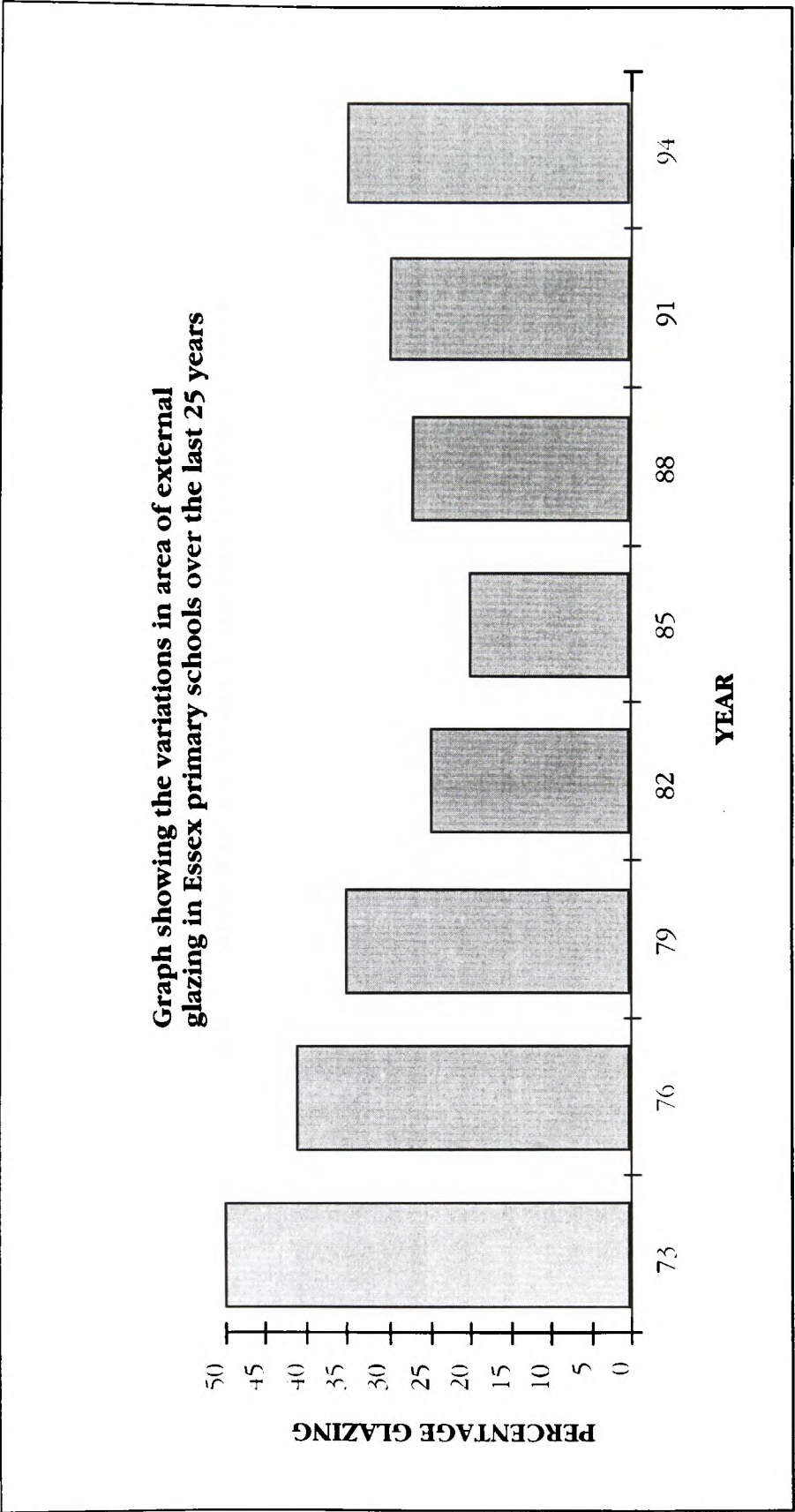
Insulation levels

Insulation levels of external walls were gradually reduced from a 'U' value of 1.0 in 1975 to 0.6 by 1985. The 'U' value of roofs was also reduced from 0.6 in 1975 to 0.35 by 1985.

Interestingly, the increased insulation available by the use of double glazing on primary schools was thought to have a unsubstantiated pay back period due to the high initial and replacement cost of sealed units. Fortunately the boom in the domestic market has reduced costs dramatically and double glazing has recently been introduced into budgets. Edge insulation under floor slabs was also used for the first time in the late 1970s (see illustration D67).

Control systems

Control systems for boiler plant up to the early 1970s were fairly crude, often consisting of a simple time clock which switched the boiler and pump on and



Based on analysis of 147 Primary schools (see French, C.P., 1994d)

ILLUSTRATION D66 - AVERAGE PERCENTAGE GLAZING OF EXTERNAL ENVELOPE IN ESSEX PRIMARY SCHOOLS.

off at the beginning and end of the school day, with an internal thermostat controlling flow temperatures to radiator circuits.

Detailed studies of the thermal performance of buildings (Crowe, R., 1973.) revealed that the use of the fly wheel effect of heavyweight building structures could reduce fuel consumption by switching the heating off when it was not needed, and more sophisticated controls which took account of optimum start times for plant using outside and inside sensors were installed in many new and existing primary schools. These new controls saved considerable amounts of energy and paid for their installation in very short pay back periods.

There was also a considerable uncontrolled heat loss from circulation pipework often hidden in ducts and roof spaces and insulating these pipes was very cost effective.

Artificial lighting

Artificial lighting was often left on in classrooms throughout the day, even though it was only needed at the beginning of the day or during periods of dull weather. Several experimental automatic switching systems were installed in primary schools to ensure lighting was switched off when not needed and lighting switches arranged to control banks of fittings away from windows, allowing those closest to the window to be switched off when natural lighting conditions allowed.

Ventilation rates

Ventilation rates from primary schools were controlled with greater care taken in sealing window/door frame joints and with the use of weather stripping to opening lights. Certain doors from classbases which opened direct onto outside teaching areas were designated summer doors for use during warm weather only, and all other doors were provided with draught lobbies. Ceiling levels in the older Victorian primary schools were also dropped and insulated to reduce the volume of air heated. Mechanical ventilation rates were also decreased to reduce heat losses from vitiated air and some experimental work was carried out on heat recovery systems, although this gave rise to complaints from users as explained later and it is doubtful if this had a significant affect on energy consumption.

Graph showing the variation in Building Regulation insulation values of construction elements over the last 25 years

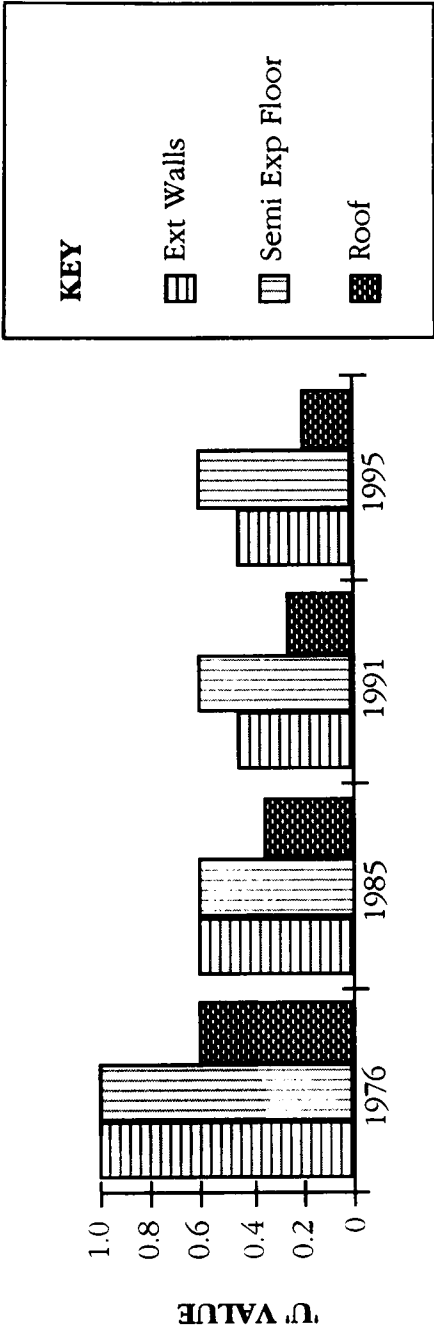


ILLUSTRATION D67 -BUILDING REGULATIONS MAX 'U' VALUES FOR DWELLINGS (1976- 1995)

Based on The Building Regulations (see Department of the Environment, 1976-1995)

The users

It was soon realised, however, that only so much wasted energy could be attributed to the building fabric and services, and much was due to the activities of users who:-

- left windows open during cold weather.
- left artificial lighting on when it was not needed.
- over-rode heating controls because they considered that temperatures were insufficient in their working space.

The Energy Conservation Group instigated a programme of user education with poster campaigns for teachers and pupils encouraging them to be more aware of energy waste, and organised training courses for caretakers showing them how to get the best from their heating plant.

Funding

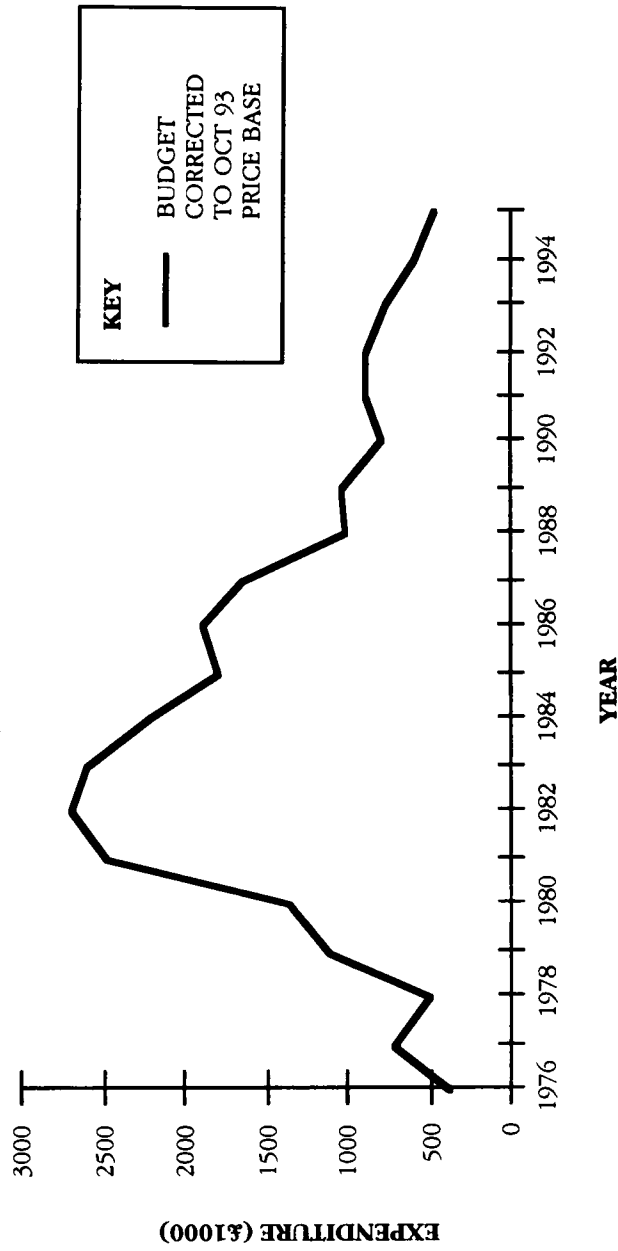
The County Council members were very supportive of the energy conservation programme and set aside substantial funds for improvements to buildings (See illustration D68), but the emphasis was on how much money could be saved by reducing energy bills. This, in turn, led to stringent pay back criteria where energy conservation measures would only be funded if the capital investment could be paid back by revenue savings within a 15 year period. This criteria often ruled out measures which saved energy and improved comfort conditions such as double glazing and draught lobbies.

8.5 THE GREEN AGENDA

Many scientists and building designers first became aware of the consequences of many design decisions on the earth's ecological system and their over reliance on non-renewable resources in the 1970s because of the crisis in the supply of fossil fuels.

Further research has revealed that although the immediate crisis has been averted through energy conservation and the discovery of further deposits of

Graph showing the variation of investment
in energy conservation measures in Essex
over the past 25 years



**ILLUSTRATION D68 - ESSEX COUNTY COUNCIL ENERGY
CONSERVATION PROGRAMME (1976-1995)**

Based on Essex County Council
Budget Records (see Metcalf, J., 1993)

fossil fuels, the effect on the earth's atmosphere of burning them is just as much of a threat to civilisation as being without.

This threat, together with the unfettered use of other non-renewable resources, has become a global problem with representatives of the developed and undeveloped countries now committed to tackling the worst problems within a predetermined time scale known as "Agenda 21" which has been endorsed by the British Government. (Department of the Environment, 1996)

The County Council is also committed to supporting this strategy at a local level and has adopted an environmental policy which impacts on primary school design. (ECC Property Services Dept, 1993)

Global Warming

It is now widely accepted that the "Greenhouse Effect" which contributes to global warming is caused by the burning of fossil fuels which produce carbon dioxide emissions. Essex County Council is, therefore, committed to actually reducing overall CO₂ emissions by minimising energy consumption in schools and other buildings and not just saving money on lower fuel bills as in the past.

Chlorofluorocarbons (CFCs)

It has also been demonstrated that the build-up of CFCs in the earth's atmosphere is leading to a depletion of the ozone layer. This not only exacerbates global warming, but may also be dangerous to mankind through exposure to harmful radiation from the sun. The County Council is committed, therefore, to a reduction in CFC emissions from its primary schools through the use of non-CFC blown insulation materials, avoiding the need for cooling using refrigeration and banning the use of CFC refrigerates generally.

Tropical Hardwoods

There is now a strong body of opinion that logging of tropical rain forests contributes to global warming and depletes an important resource that may not be replaced. Essex County Council now discourages the use of tropical hardwoods in its primary schools unless they can be shown to originate from sustainable sources. The use of non-tropical hardwoods or suitable softwood which 'lock up' CO₂ is recommended as a replacement as many of the raw

materials for alternative materials such as steel, aluminium or PVC are also non-renewable and release CO₂ during manufacture.

Water Saving

Water is a valuable resource particularly in a naturally dry county like Essex and its use needs to be controlled to avoid waste. The County Council encourages the management of water consumption in primary schools, therefore, through the use of devices such as spray and concusive taps, automatic urinal flushing devices, dual action wc flushes and installation of water meters with payment of water bills from school funds.

Recycling.

The construction industry consumes large quantities of materials such as aggregates, clay and stone from non-renewable sources. Essex County Council encourages primary school designers to use as many recycled materials as possible including crushed concrete aggregates and second-hand timber and bricks. It also encourages the recycling of packaging and other waste materials by the provision of storage areas in all schools awaiting collection by recycling agencies.

Hazardous and Toxic materials

The construction of new school buildings can involve the use of potentially toxic chemicals and materials. The County Council encourages designers to consider the use of non or less toxic alternatives to fungicides, pesticides, adhesives, paints, lead piping, asbestos, formaldehyde, etc. with particular care taken of their affect on water supplies as well as other agents such as legionnaires disease.

Checklists and assessment methods

As with other environmental issues it is important to keep the various green policies in perspective and avoid an imbalance between them. The Property Services Department has produced a checklist for designers (ECC Property Services Dept, 1993) which ensures that design teams are fully aware of design decisions on the greater environment. The County Council is also encouraging all primary schools to use the new DfEE schools environmental assessment

method (DFEE, 1996) which attempts to provide schools and designers with a weighted self-assessed rating system covering a range of green issues culminating in a total point score for new or existing buildings.

This will hopefully encourage schools to be more aware of their building's performance and provide educational value by acting as a model for future generations to study.

Economics

It is also interesting to note how financial considerations drove the early attempts at energy conservation in primary schools with an emphasis on saving money rather than energy. It would appear from interviews with County Council officers that similar attitudes are also influencing green issues with clients prepared to support alternatives which do not harm the global environment providing they do not cost more.

Other issues

It is true that about half of the UK fuel bill is accounted for by the energy requirements of its buildings but a large proportion of the other half is used in transporting goods and people. It is possible for the planning and use of primary schools to have a small impact on transport fuel costs by locating schools near the housing they serve and encouraging staff, parents and children to walk or cycle to school.

8.6 FUEL SOURCES

Primary schools in Essex have traditionally been heated using either oil, gas or electricity with the use of solid fuel almost extinct by the early 1970s as a result of the Clean Air Act, cost of fuel storage and the manpower needed to operate feeding mechanisms.

Oil

Oil was the most popular fuel source for primary schools during the early 1970s as it was relatively cheap if purchased in bulk. The heavy fuel oil used at this time, however, required expensive flues to comply with the Clean Air Act, and storage tanks on site to keep stocks for the winter months.

The oil crisis of the mid 1970s dramatically raised the price of oil and the County Council spent considerable sums of money converting boilers to gas fired where mains gas was available.

Gas

Gas was more expensive than oil in the 1970s, but was often used in primary schools at this time as it is almost as efficient as an energy source, does not require a flue or storage tanks on site, is cleaner and has reduced maintenance of boilers. It also became an attractive alternative to oil as the price of oil rose and the cost differential diminished.

Electricity

Electricity as a fuel source is also clean and does not require a flue, but has a relatively poor efficiency as it has to be generated using other fuels such as coal, oil or gas. This makes it an expensive choice for heating primary schools, although there is often very little choice for temporary buildings such as relocatable classrooms.

Calculations by scientists during the 1970s oil crisis predicted that resources of oil and gas would be exhausted by the turn of the century and electricity generated by nuclear plants would be the only fuel available. As a result the County Council's environmental engineers encouraged the experimentation with several different heating systems aimed at using electricity more efficiently, such as heat pumps and electrode boilers which are discussed in more detail later.

The sun

The sun radiates enormous quantities of free energy onto the earth's surface which can be used to heat primary schools, even in the northerly climate of Great Britain, using solar passive design techniques which are discussed in detail later in this chapter.

Economics

It is also important to recognise the importance of the relative cost of different fuels over the past 25 years and the various deals struck by the County Council Tariff Officers.

At the beginning of this period oil was the cheapest fuel, but as the cost rose due to the oil crisis of the mid 1970s, gas and electricity became very attractive. (See Illustration D69). Many of our new primary schools were built in developing areas, however, which did not have gas supplies and electricity was the only fuel available.

As oil prices settled down in the mid 1980s, gas became more readily available and the cost dropped due to ample North Sea supplies, and gas remained the preferred option for most primary schools.

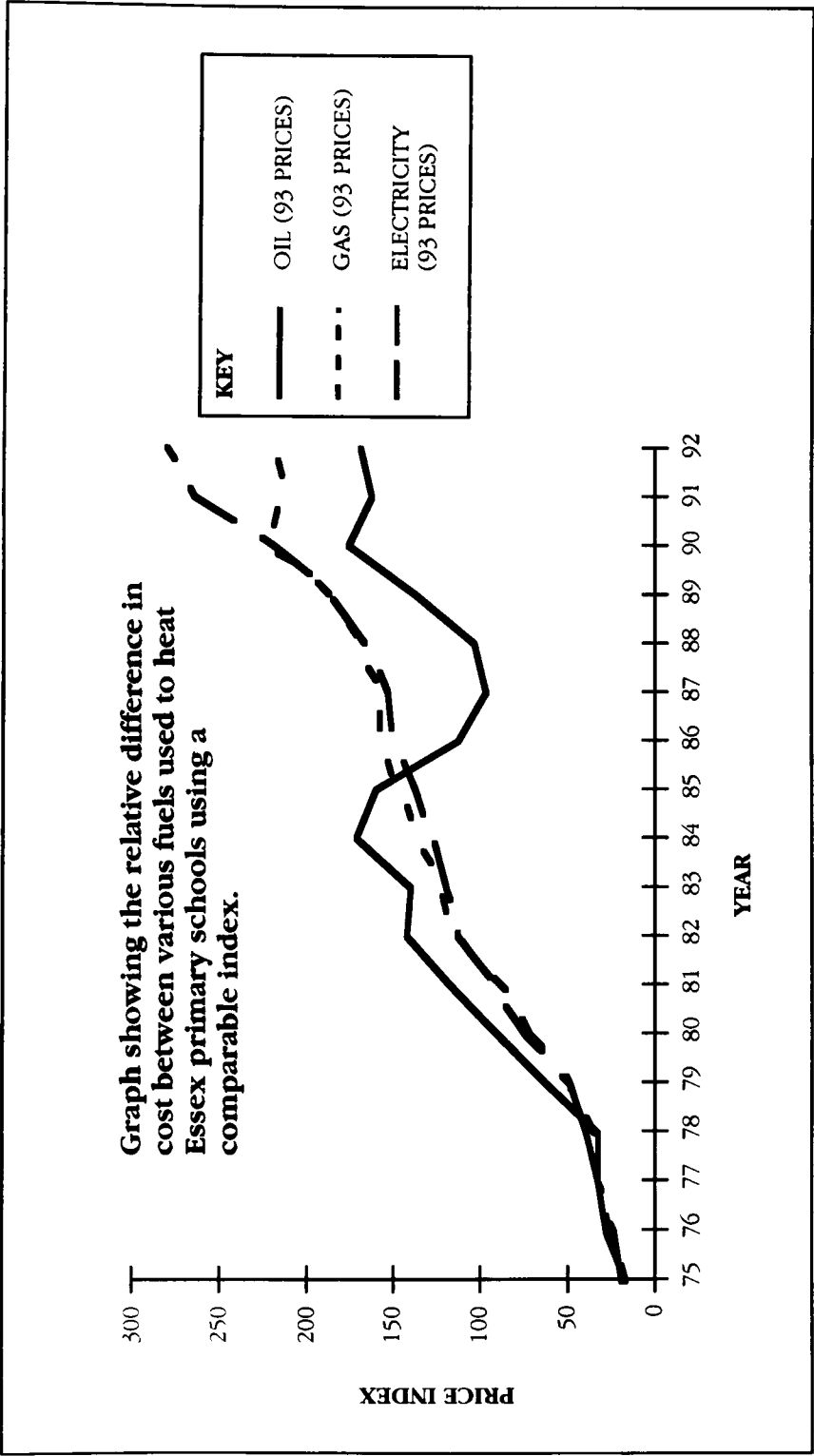
World oil prices have fallen even further during the early 1990s and in many instances this is now the most economic choice of fuel, particularly when the privatised gas companies demand huge connection charges to cover their infrastructure costs. The need for a tall flue, storage tanks and its somewhat messy technology is often the deciding issue in the gas versus oil debate, however.

8.7 HEAT PUMPS

A heat pump is an electrically driven compressor which extracts low grade heat from a natural resource such as ground water or the atmosphere using the principles of reverse refrigeration.

If the heat pump is sufficiently efficient and the heat source constant, then more energy can be extracted than is taken to run the compressor, providing a cheap source of energy to heat a building.

The predictions of the experts that fossil fuels would be exhausted by the end of the century encouraged the development group to find a more efficient way of using electricity as a fuel source, and several experimental heat pumps were installed in Essex schools in the early 1980s, including air to air, water to air, and air to water.



Based on County Council Fuel Price Index (see Metcalf, J., 1993)

ILLUSTRATION D69 - ESSEX COUNTY COUNCIL FUEL PRICE INDEX



Air To Air

Air to air heat pumps were installed at Roach Vale Primary School in Colchester where air for the warm air heating and ventilation system was heated using roof mounted heat pumps, recovering heat from solar preheated air drawn from the glazed atrium.

Water to water

A water to water heat pump was used at Ravenscroft Primary School in Clacton to extract heat from ground water pumped up from bore holes sunk into the natural aquifer. This heat was passed to water which was circulated through coils buried in the floor providing under floor heating (see illustration D70 and D71).

Air to water

An air to water heat pump was installed at Tendring High School at Walton-on-the-Naze to heat a new science block. The heat pump was mounted on the roof within a glazed enclosure which was used to solar pre-heat fresh air drawn in through inlet grilles. Heat is extracted from this air and passed to water which is circulated through a traditional low pressure hot water heating system with radiators.

Operating problems

Unfortunately, much of the technology for these experimental heat pump schemes was fairly new and untested under such conditions, and considerable problems were experienced at the schools including:-

- Unreliable control systems which led to many breakdowns and failures.
- Unreliable extraction rates from the heat source leading to underheating at certain times of the year.
- Problems with pumping ground water from bore holes with flooding from return flows caused by a lack of porosity of the ground at certain times of the year.

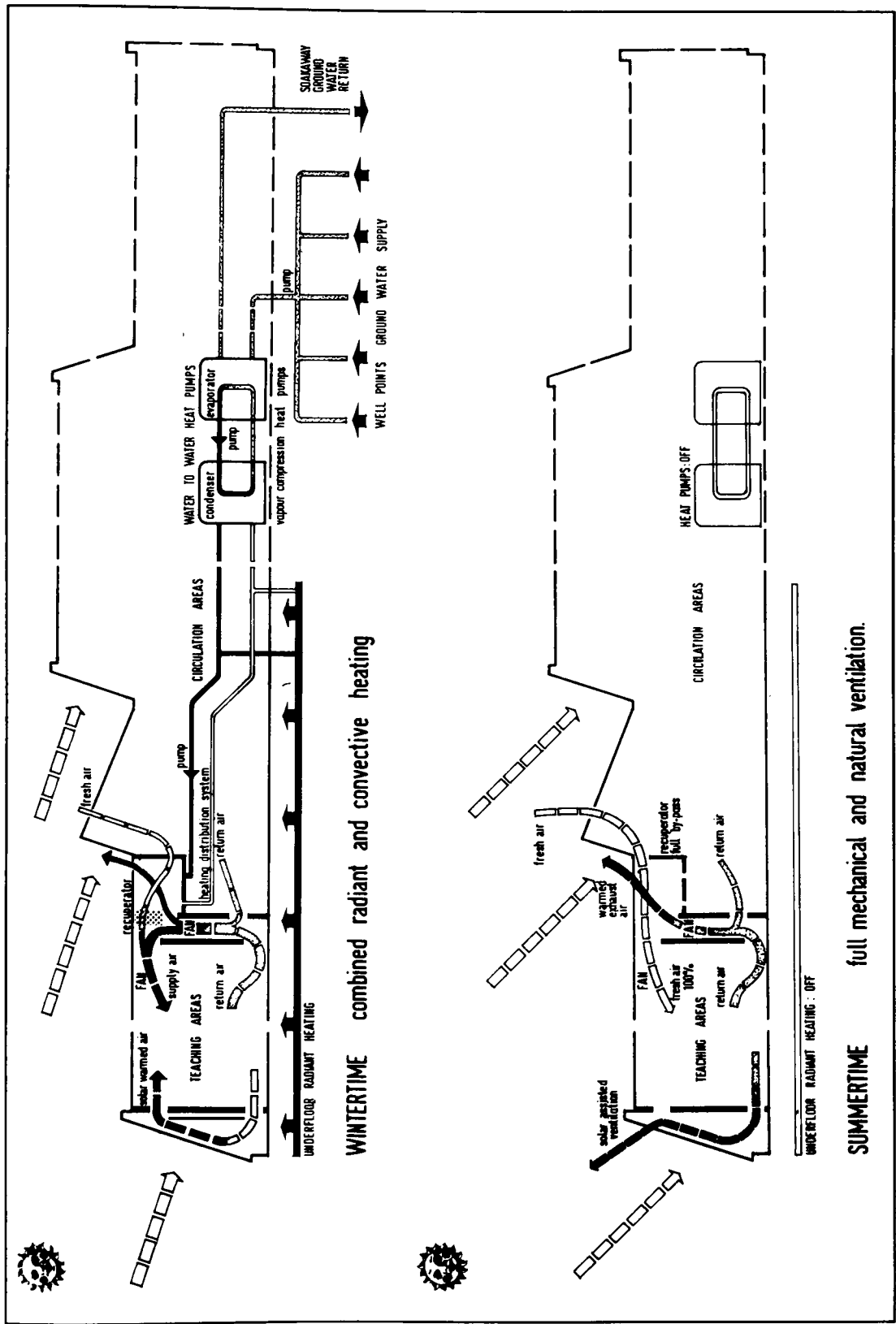


ILLUSTRATION D70 - HEAT PUMP INSTALLATION AT
RAVENS CROFT PRIMARY SCHOOL, CLACTON.
Showing different operation in winter and summer

Reproduced from Committee
Brochure (see ECC Architects Dept,1980.)

These problems were not resolved quickly due to the lack of experience of this type of technology by maintenance staff, and a lack of ownership of the design by the department's engineers, after the original designers had left the County Council's employment. As a result, the performance of heat pump schemes has been heavily criticised by the users of the buildings and this technology has gained a universally poor reputation throughout Essex, with at least one set of heat pumps at Ravenscroft Primary School in Clacton replaced by gas fired boilers.

It should be pointed out, however, that the heat pump experimentation was carried out at a time when learned opinion was that this would be the technology of the future and this experience could have promoted the department to leaders in the field. Predictions of impending doom proved to be unfounded as new sources of fossil fuel were discovered, however, and these experiments now appear to have been rather premature.

8.8 SOLAR PASSIVE DESIGN

The introduction of environmental engineers into the department and the emphasis on energy conservation, led several design teams involved with development projects to produce solar passive solutions for new primary schools. These varied from the simple use of solar heated spaces such as conservatories, to fully blown solar passive designs using micro-climate, orientation, shading, solar collectors and solar heated spaces.

Micro-Climate

This is the use of planting and mounding around a school to screen the external fabric from the cooling effect of winter winds and the overheating affect of summer sun. It can also create a micro-climate around the school which is particularly beneficial to outside teaching, with warm shaded spaces protected from the wind for outside activities in summer. This approach was particularly successful at Ravenscroft Primary School, Clacton where the northern elevations were protected from chilling winds on an exposed coastal site by mounds and tree belts. The south facing patios outside classrooms protected by low walls and planting are also much appreciated by pupils and staff at St. Peter's Primary School, Coggeshall.

Orientation

Several primary schools including St. Peter's, Coggeshall and Ravenscroft, Clacton were planned so that all of the main teaching spaces faced south, south east or south west to gain as much solar heat during the winter months as possible, with service areas such as toilets, kitchens and administrative spaces sited on the northern elevations. Glazing on the southern orientation was generous with up to 50% of the external wall area glass, whereas windows on the north side were reduced to a minimum, often as low as 15% of the external wall area. The highly glazed southern facades, however, could lead to overheating during the summer months and they had to be protected by overhanging eaves as at St. Peter's, Coggeshall.

Solar heated secondary spaces

Many primary schools constructed in the 1980s were planned with secondary space for use as circulation and/or practical activities. This space usually had a fully glazed roof with one or more glazed walls, and relied entirely on solar heating to maintain comfort conditions for all or part of the year. These secondary spaces can be divided into certain types with a clear evolutionary pattern explained in Chapter 2.

COVERED COURTYARD

The covered courtyard was first used successfully in schools such as Cherry Trees at Colchester, Roachvale in Colchester and Barnes Farm Junior School in Chelmsford. They were simply schools planned around a central courtyard previously used to bring natural light and ventilation into the centre at a deep plan, which had been covered over and provided with an opening glazed roof light. These schools proved to be very successful with a relatively even environment in the courtyard throughout the year allowing it to be used for a variety of uses (see illustration D72).

ATRIA

The covered courtyard developed into a specially designed glazed unheated atria, often situated between two banks of classrooms which acted as the main circulation route and activity area, the best examples being Nabbotts Primary School in Chelmsford and Barnes Farm Infants School in Chelmsford.

The narrow proportions of these atria and well ventilated opening roof lights meant that they were comfortable for much of the summer, but were unusable for certain activities in deep winter when the lack of heating and solar gain produced unacceptably low temperatures (see illustration D75).

CONSERVATORIES

Several primary schools including Whitecourts in Braintree and Ravenscroft in Clacton also incorporated solar heated conservatories within their design, situated on the east, west, or south elevations with access direct from classbases to be used for practical activities. Unfortunately, these spaces had small volumes, were poorly ventilated and temperatures in summer rose to unacceptable levels. In winter they dropped to unacceptably low levels with school use limited to short periods of the spring and autumn. The severe criticism by users of the poor comfort conditions led ultimately to their demise (see illustration D73).

GLAZED STREET

The atrium has also developed into the glazed street or corridor which is used as the main spine of the school connecting the teaching bases and ancillary accommodation as well as being used for other uses such as practical bays and libraries, etc. These streets are usually fairly narrow with patent glazed roofs and are heated in winter to give use throughout the year. They have been successfully used at St. Peter's, Coggeshall, Highwoods, Colchester and Shelley, Ongar, although St. Peter's has experienced overheating problems at certain times of the year due to a lack of sufficient opening lights in the patent glazing (see illustration D74).

Solar collectors

The department has also experimented with various types of solar collectors throughout this period including thermo-siphoning air panels, conservatories, greenhouses and traditional roof mounted solar collector panels.

THERMO-SIPHONING PANELS

Thermo-siphoning air panels were installed on the southern facades of Ravenscroft Primary School, Clacton and fitted retrospectively as part of a recladding scheme at Nazing Primary School (See Illustration D76).

Unfortunately, neither of these schemes has operated correctly due to the need for teachers to open and close various vents at different times of the year, and monitoring has shown that their contribution to heating of the school does not warrant the expense of their construction (Centre for Performance Research on the Built Environment, 1992).

CONSERVATORIES

Several schools, such as Ravenscroft and Roach Vale, incorporated greenhouses on the roof, lean-to conservatories against outside walls or internal glazed courtyards which were used to collect solar gains to pre-heat air used as part of a warm air heating and/or ventilation system.

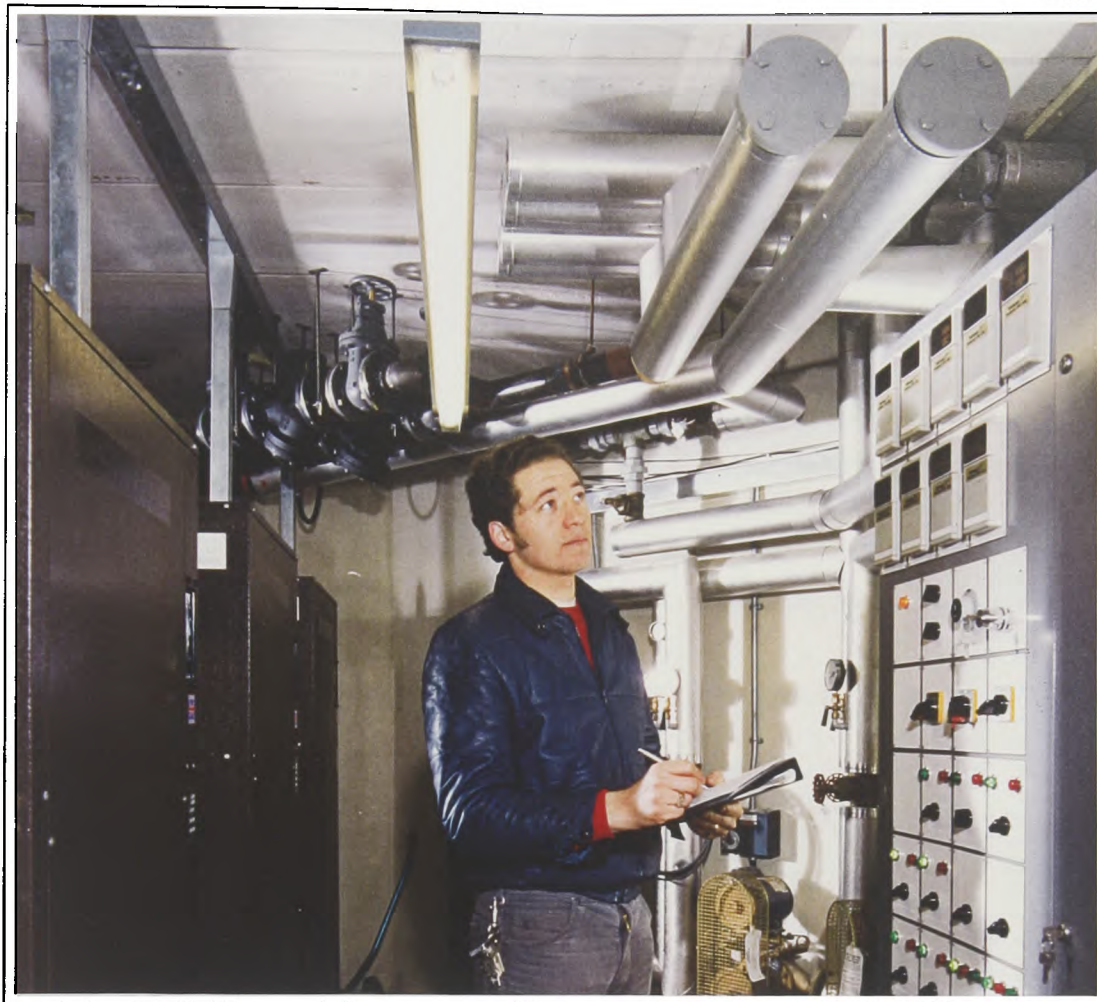
SOLAR PANELS

One or two schemes have incorporated traditional solar panels mounted on south facing roof slopes to heat water for use in the kitchen and washrooms throughout the school. The most successful project was the Castlevue Secondary School, Canvey Island which is still in operation and making a significant contribution to reducing energy costs. The other scheme at Briscoe Infants and Junior Schools, Pitsea does not appear to have ever worked properly and the gas backup heaters have been used as the primary energy source throughout the life of the school.

Thermal mass

Environmental engineers revealed the importance of thermal mass in modifying extremes in temperature gradient throughout the primary school early in the 1970s, by locking up heat during the day and releasing it at night, but this has seldom been used successfully in primary school design.

It is true that the switch to a heavyweight system such as MCB from the lightweight steel framed SEAC system improved the thermal mass of most



PLANT ROOM



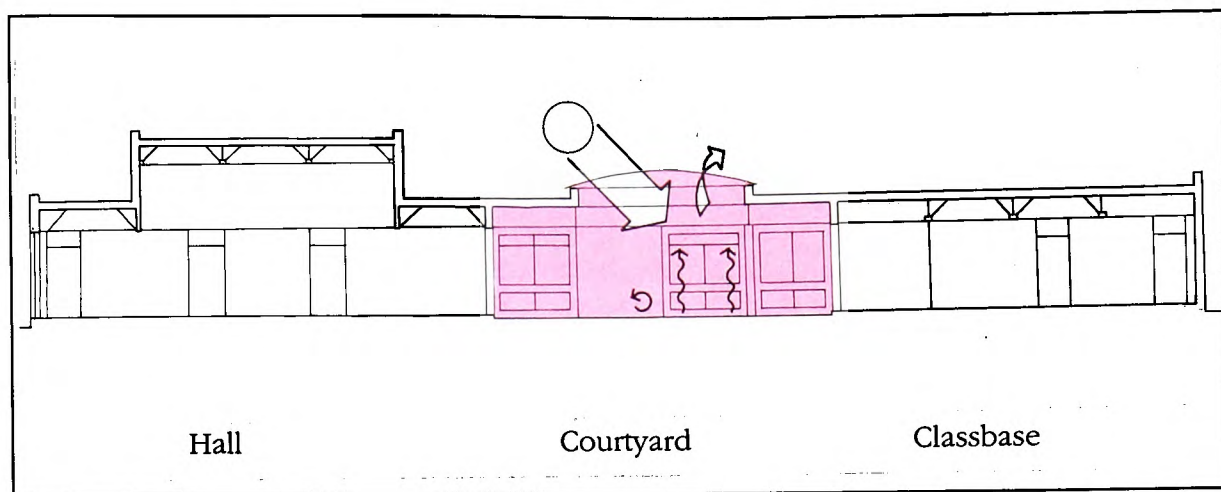
ROOF MOUNTED RECUPERATOR

**ILLUSTRATION D71 - PLANT ROOMS AT
RAVENS CROFT PRIMARY SCHOOL, CLACTON.
Showing the heat pump installation (now removed)**

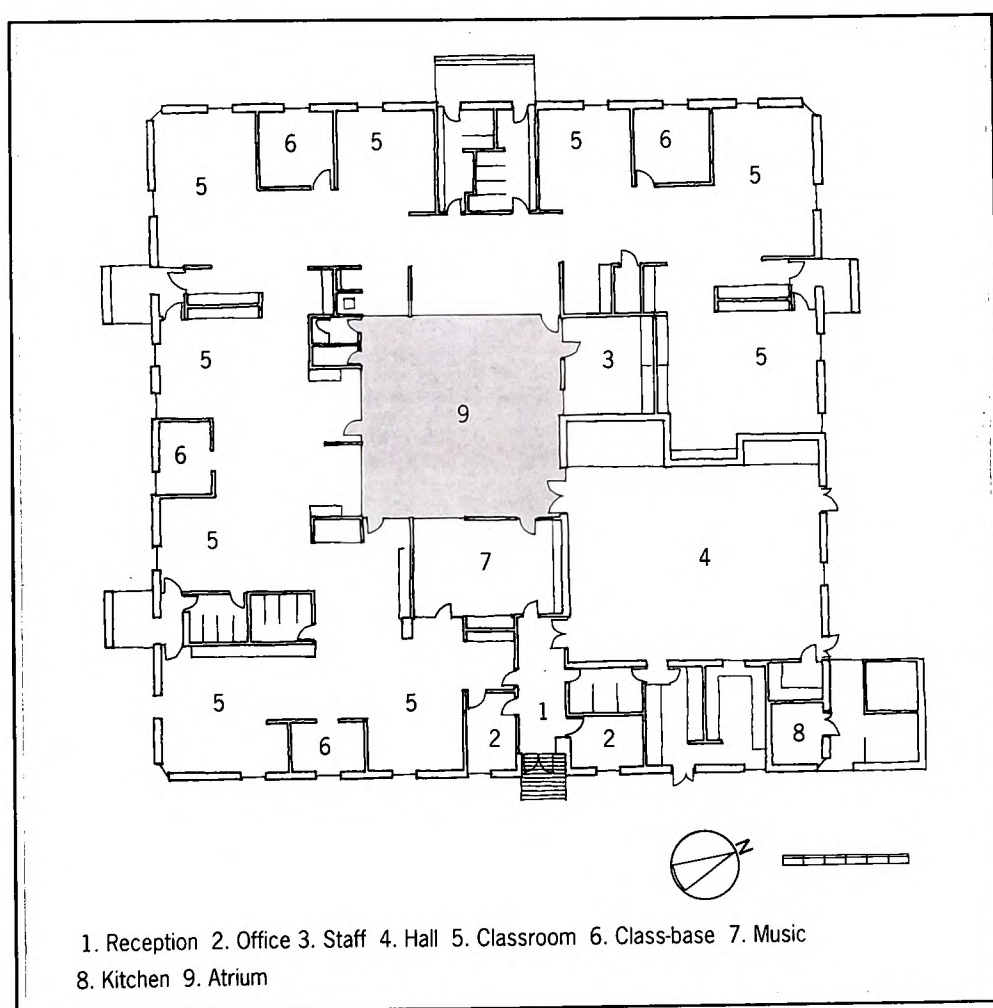
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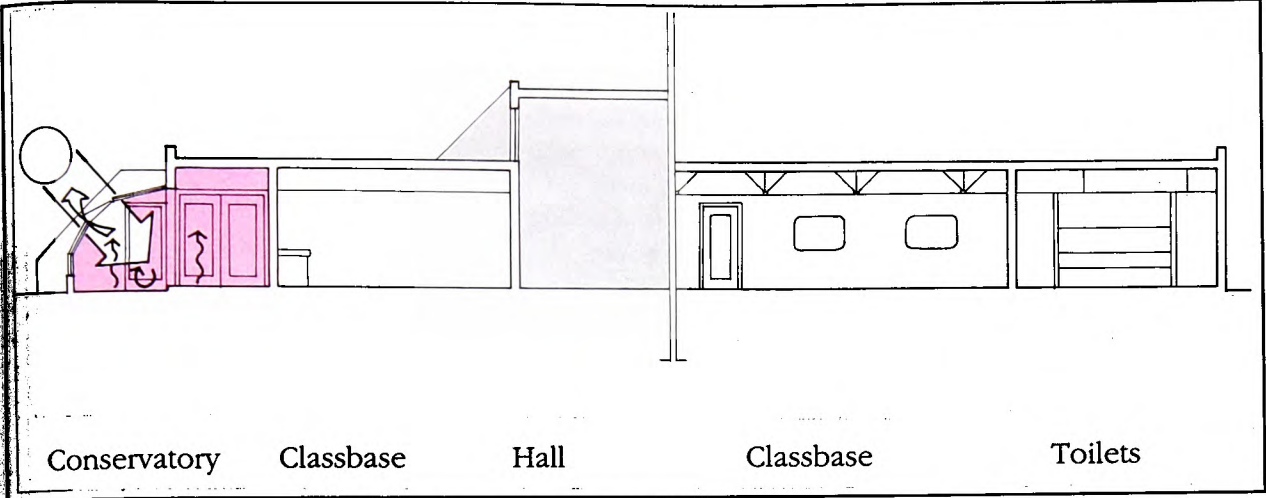
SECTION showing central covered courtyard with glazed opening roof.



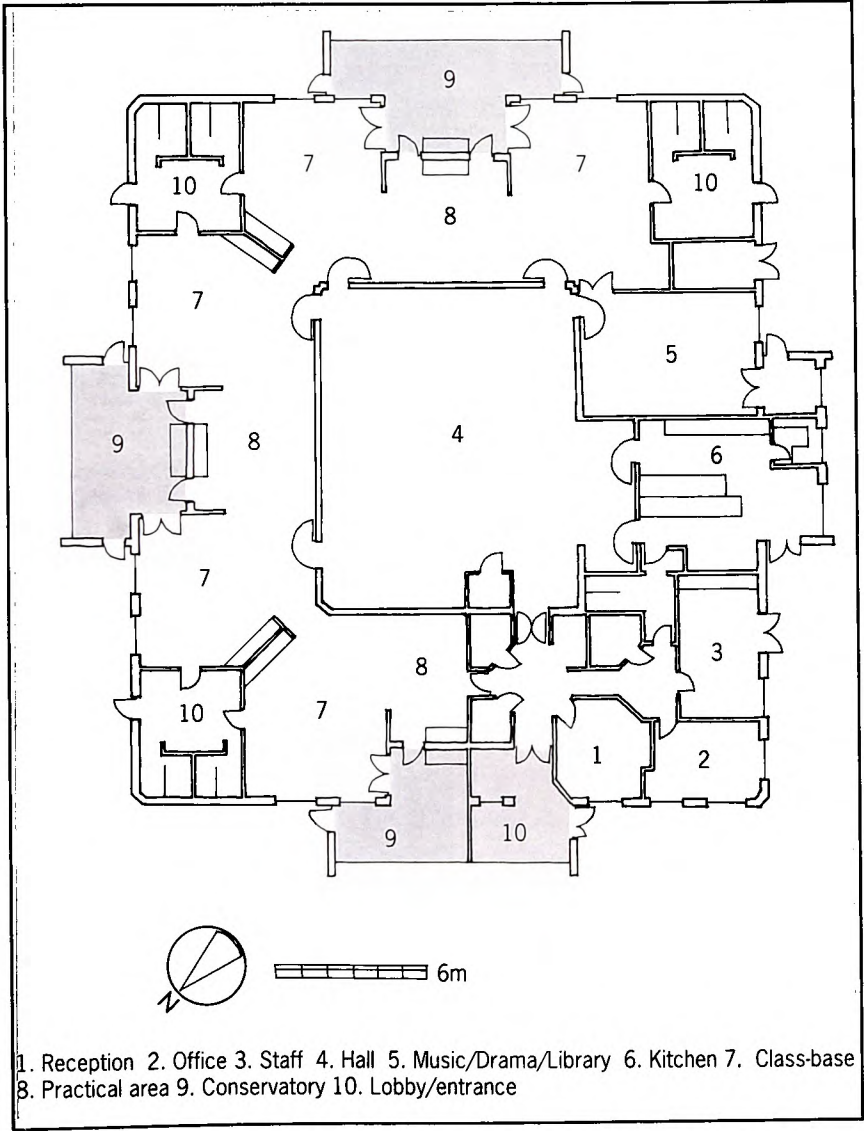
PLAN showing central courtyard for practical activities and circulation.

Reproduced from Building Bulletin 79
(see Department of Education and Science, 1994.)

**ILLUSTRATION D72 - SOLAR HEATED COVERED COURTYARD
AT CHERRY TREE PRIMARY SCHOOL, COLCHESTER.**



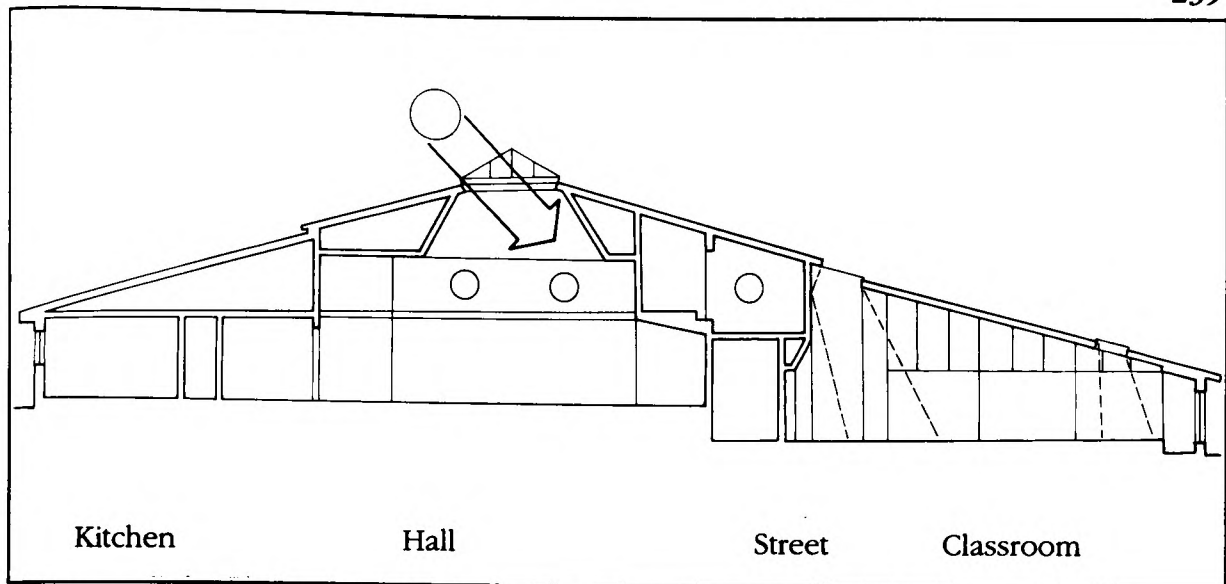
SECTION showing consrvatories opening off classbases.



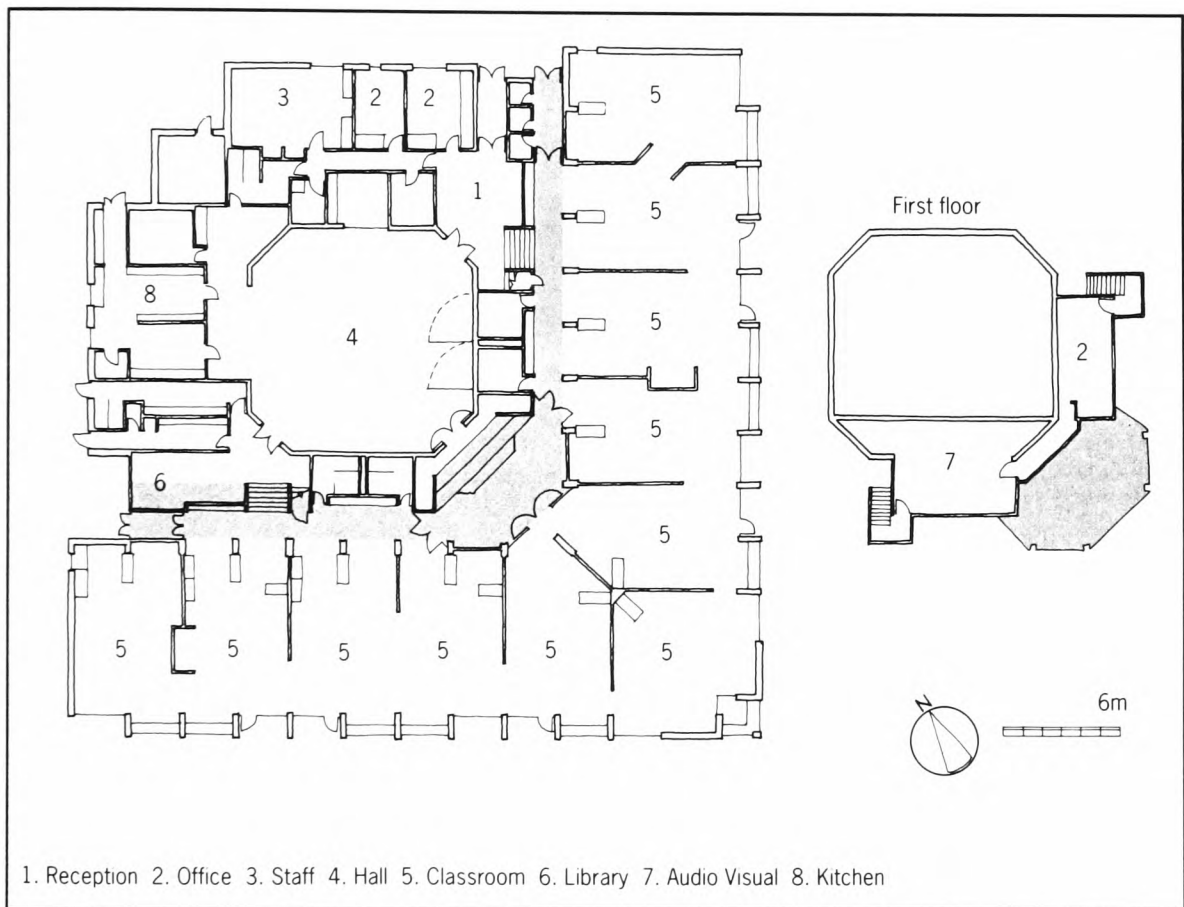
PLAN showing conservatories sited around the perimeter.

Reproduced from Building Bulletin 79
(see Department of Education and Science, 1994.)

**ILLUSTRATION D73 - SOLAR HEATED CONSERVATORIES
AT GREAT LEIGHS PRIMARY SCHOOL.**



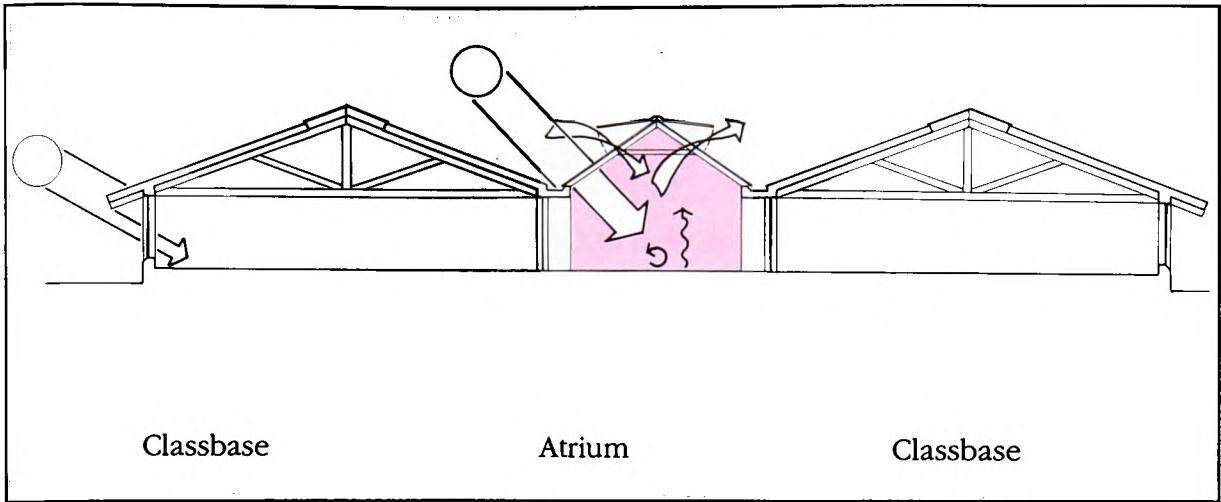
SECTION showing patent glazed street lighting the deep plan.



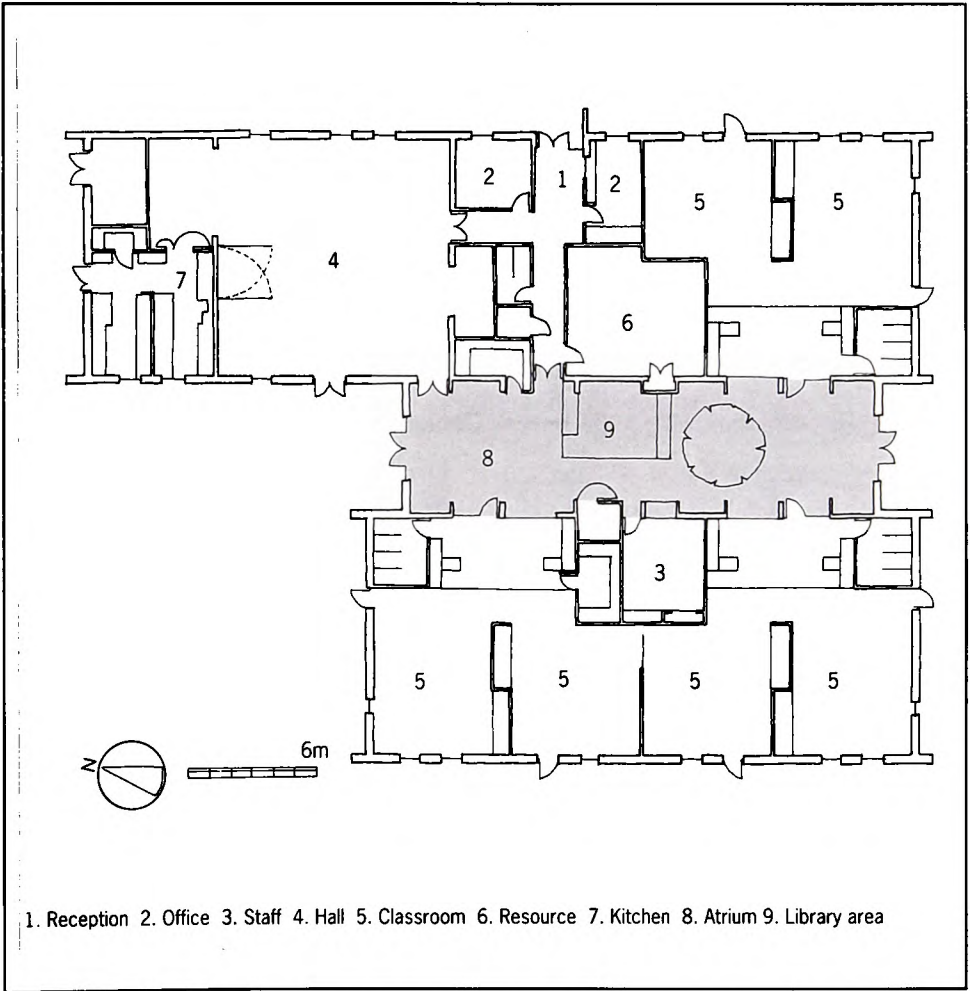
PLAN showing top lit street for circulation and practical activities

Reproduced from Building Bulletin 79
(see Department of Education and Science, 1994.)

**ILLUSTRATION D74 - SOLAR HEATED STREET AT
ST PETERS PRIMARY SCHOOL, COGGESHALL.**



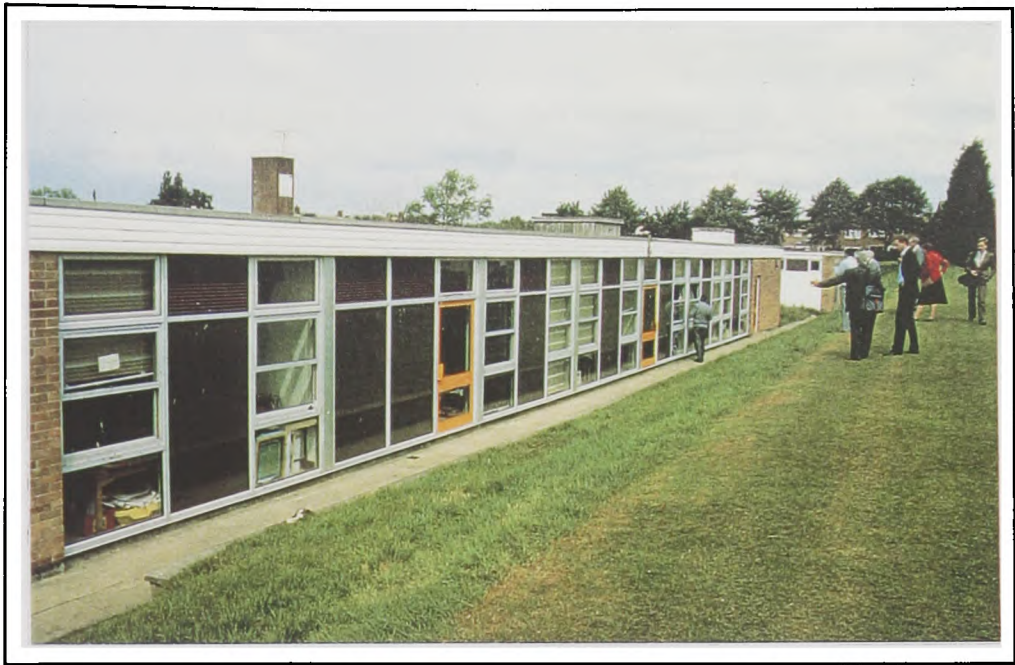
SECTION showing glazed atrium.



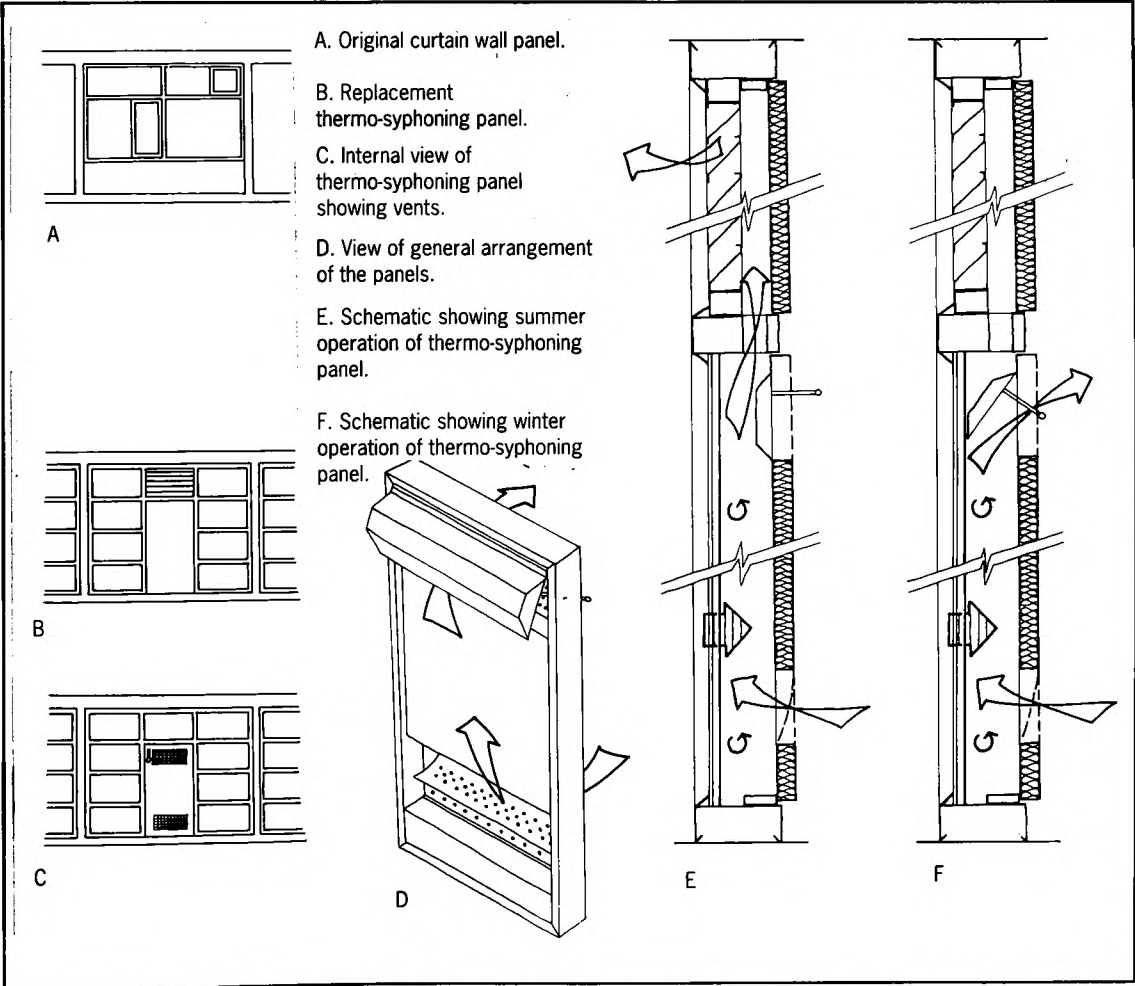
PLAN showing glazed atrium for practical activities and circulation.

Reproduced from Building Bulletin 79
(see Department of Education and Science, 1994.)

**ILLUSTRATION D75 - SOLAR HEATED ATRIUM AT
BARNES FARM INFANTS SCHOOL, CHELMSFORD.**



ELEVATION showing thermo-syphoning air panels between windows



SECTION showing operation in winter & summer conditions.

ILLUSTRATION D76 - THERMO-SYPHONING AIR PANELS FITTED AT NAZING PRIMARY SCHOOL

Reproduced from Building Bulletin 79 (see Department of Education and Science, 1994.)

primary schools (See illustration D77), and this tradition has continued with the use of brick and blockwork in current traditional designs, but the current insulated timber pitched roofs tend to be lighter in weight than MCB and do not contribute towards thermal mass.

Unfortunately, much of the potential for using the heavy-weight elements of these buildings such as the concrete floor and concrete block external walls and partitions as a heat sink, is severely reduced by the extensive use of pinboard and carpet which effectively insulates these surfaces.

Thermal modelling of primary schools using computer prediction programmes such as TAS often reveals the importance of thermal mass at certain times of the year and the day, and more recent designs such as Church Langley Primary School, Harlow have addressed this problem by including a concrete roof which can be permanently exposed to the air on the underside and act as a heat sink to moderate the internal environment of teaching spaces.

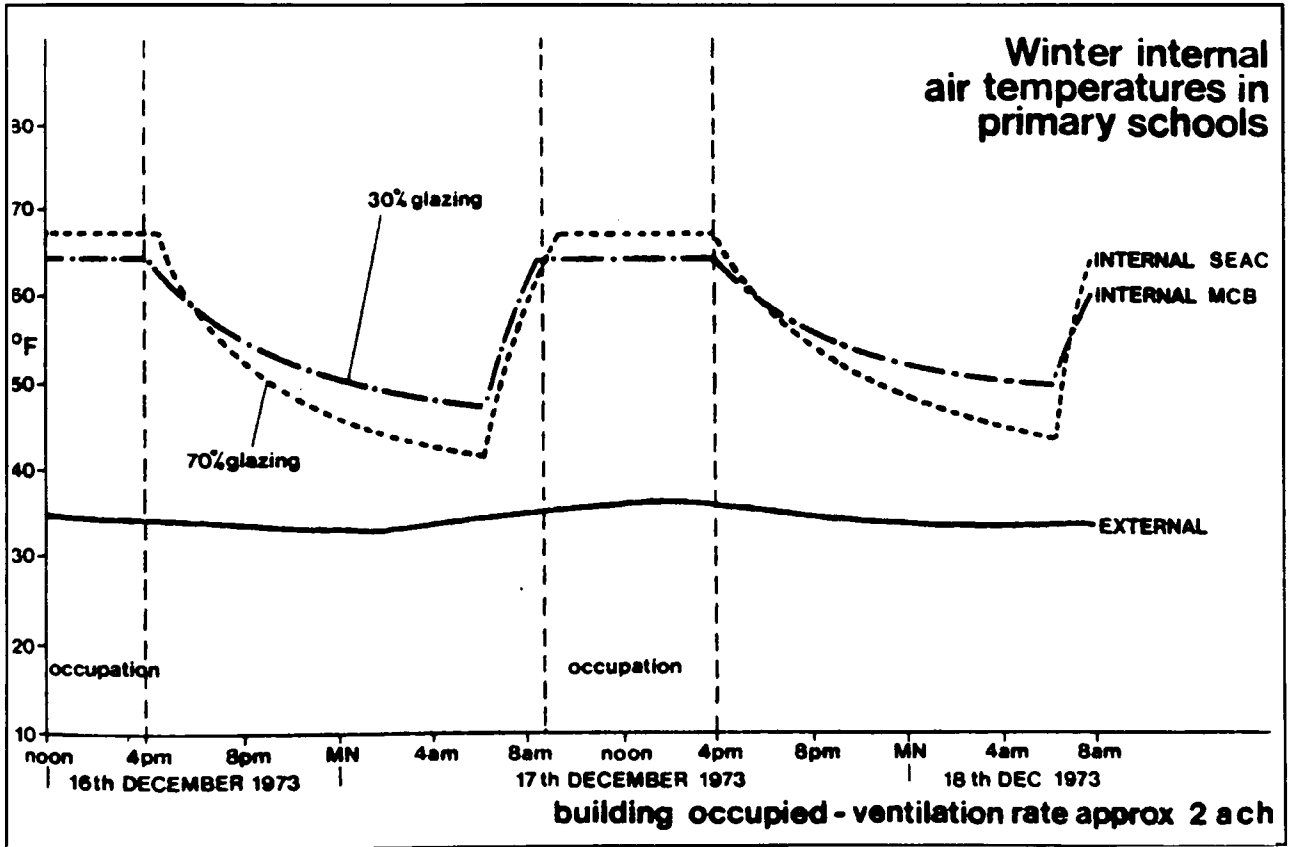
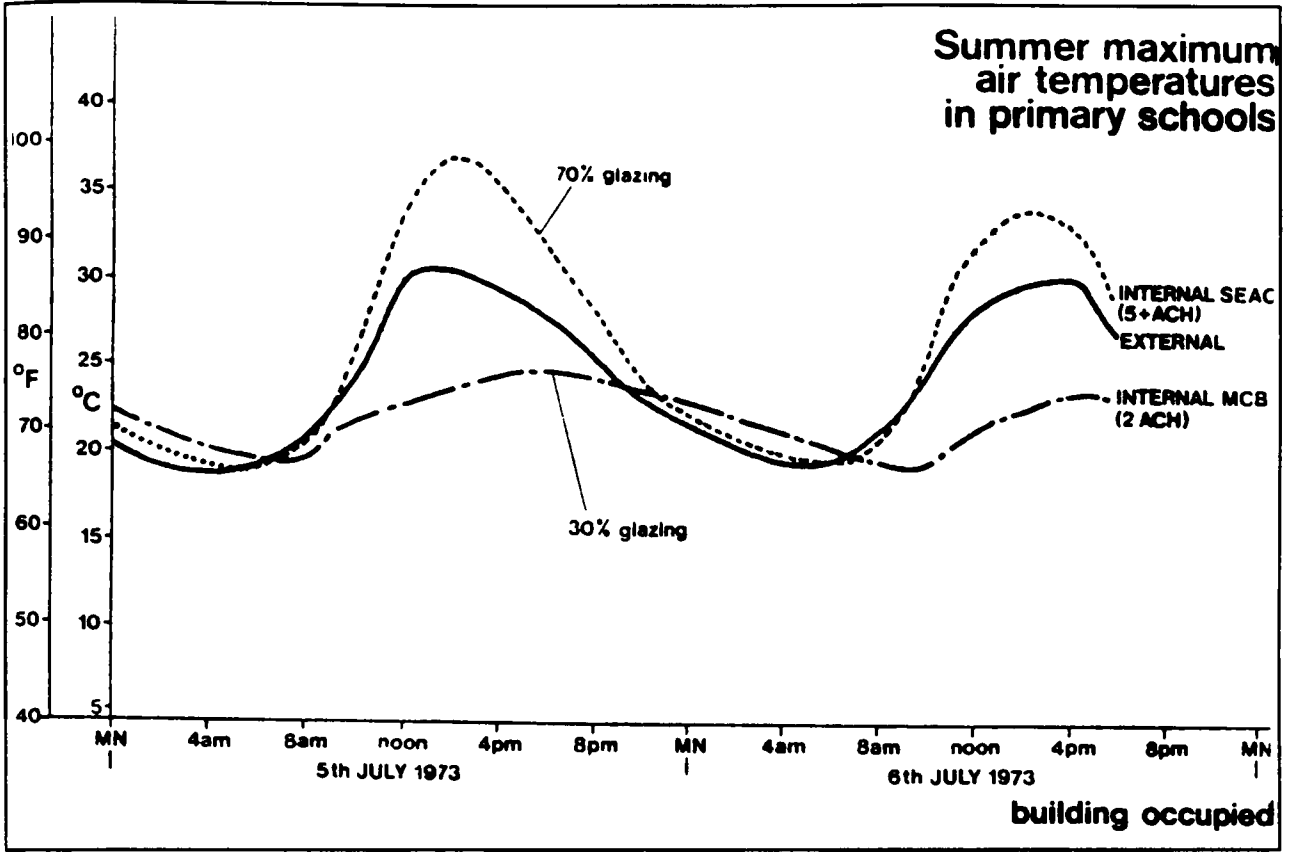
Overheating

As insulation values of the building fabric have increased and daylighting levels improved by use of greater areas of glazing, the greatest problem in modern primary schools is overheating at certain times of the day and year. If we are to avoid the use of air conditioning then the use of external shading devices, greater thermal mass and possibly night time ventilation will be the only answer. The latest primary school development project at Church Langley is attempting to put these principles into use (Essex County Council Property Services Dept, 1994).

Monitoring

Many of the Essex solar passive primary schools and heat pump projects have been monitored in use by academic institutions such as Cranfield Institute of Technology, the Martin Centre, the Electricity Council, the Gas Council and other consultants, using European Community funding and other grants.

This monitoring using sensors, inside and outside the building, with data logging equipment has allowed the researchers to collect performance data



**ILLUSTRATION D77 - SHOWING THE FLYWHEEL
EFFECT OF A HEAVYWEIGHT MCB STRUCTURE.**

Reproduced from County
Architects Brochure (see
Essex County Architects, 1973)

through different patterns of use and weather conditions and with plant either on or off.

The results of monitoring has shown that :-

- Heat pumps use less energy than traditional heating systems, but cost more to run due to the high cost of electricity (Essex County Council Property Services Department, 1996).
- Thermo-syphoning air panels do not contribute sufficient heat to classbases to repay the cost of their installation within a 25 year repayment period (Centre for Performance Research on the Built Environment, 1992).
- The thermal performance of certain shapes and orientations of glazed atria are sufficiently efficient to warrant heating them during the winter to make them more usable (DES, 1994).

The feedback from such monitoring has resulted in an accumulation of knowledge within the department about experimental heating and ventilation systems to ensure that mistakes are not repeated and successes are applied to future projects.

8.9 THERMAL INSULATION

Thermal insulation levels of the external fabric of Essex primary schools has increased dramatically since 1973, from the relatively poorly insulated SEAC system building to the increased performance of the MCB schools, and today's highly insulated traditional construction.

Generally, increased levels of insulation have been driven by energy conservation measures and the County Council has attempted to provide better levels of insulation than those demanded for domestic dwellings under the Building Regulations (See Illustration D67). They were also encouraged to improve levels of insulation by the Department of Education who insisted that all schemes funded by the Department met the standards within Design Note 17, which were originally more onerous than the Building Regulations, but have not kept pace with them over the past 10 years.

Thermal insulation was improved in various parts of the fabric including walls, roofs, floors and heat loss through ventilation.

Walls

The external walls of SEAC primary schools consisted of single glazed steel windows or various types of lightweight cladding with minimal insulation such as a 50mm. fibreglass quilt giving a U value of about 1.5. The new solid lightweight concrete wall panels of MCB were better insulated with a U value of about 1.0, but more recent traditional construction with cavity brick outer and lightweight concrete block inner skins with the cavity filled with insulation gives a U value of 0.35.

Glazing

The percentage of glazing has varied over the last 25 years from 50% in SEAC buildings down to as little as 20% in the punch hole glazed MCB schools of the 1980s (see illustration D66). Generally windows have been single glazed and have had a major effect upon the insulation value of external walls. More recently double glazing has been used on new primary schools, which has allowed greater areas of windows for good natural lighting without dramatically reducing insulation levels.

Rooflights were also used prolifically in SEAC schools, but almost eliminated in the MCB schools of the 1980s due to the importance attributed to roof insulation at that time. Areas of roof glazing have increased during recent years and now contribute a significant amount of natural lighting in most primary schools. often double glazed to reduce heat loss, but more importantly to reduce the risk of condensation.

Roofs

The flat roofs of SEAC primary schools were relatively poorly insulated, with a metal deck covered with fibreboard and asphalt. The flat roofed MCB schools of the 1980s had a well insulated aerated concrete plank roof covered with asphalt, as this was seen to be the greatest area of heat loss in the deep plan schools of this time.

The roof insulation was increased even further as the MCB system developed when external polystyrene panels were laid on top of the asphalt and weighted down with pea shingle.

More recent traditional pitched roof schools have relied on fibreglass or mineral wool insulation quilt or batts laid in the ventilated roof void to act as insulant, although the trend of exposing the roof void has led to the use of thinner, more efficient sheet insulants such as foamed polyurethane, needed in the reduced depths of such structures to maintain anti-condensation ventilation.

Floors

Heat losses through floors were ignored for many years until the early MCB schools started to install edge insulation around the perimeter, using polystyrene slabs under the concrete floor slab. The increased use of suspended concrete plank floors to accommodate movement problems on Essex clay soils has led to the use of such insulation beneath the screed over the entire floor area in more recent schools.

Uncontrolled ventilation

Joints between the various components which make up the external skin of the primary school were traditionally great sources of uncontrolled heat loss during the winter, especially in the SEAC schools, with their reliance on cover strips to seal joints. The MCB system attempted to rectify this poor sealing through the use of gaskets and mastic joints between components and weather strips round opening windows and doors, but some of this technology was lost when the Department reverted to more traditional methods of construction, with some notable examples of excessive heat loss through poorly sealed ventilated roof spaces.

8.10 DAYLIGHTING

As mentioned previously, it is important to balance the beneficial effect of natural daylight through windows and roof lights with the heat gain and heat loss through the poor insulation of glass and the cost of providing supplementary artificial lighting in poorly lit spaces. It is also important to take into account the beneficial effect of natural sun and daylight on pupils and

teachers as they go about their daily tasks, as well as the added interest that a shaft of daylight can create by illuminating a particular shape, colour or texture of the school's interior.

Daylight factor

Daylighting in primary schools throughout Great Britain in the 1950s and 60s was based upon the minimum 2% daylight factor required by DES Regulations (i.e. 2% of the amount of daylight from a standard overcast sky should reach every part of the primary school classroom at desk top height). To achieve this minimum daylight factor primary school classrooms were relatively narrow in depth, with fairly large window areas, in some case up to 50% of the external wall area. Where classrooms were double banked either side of a circulation corridor, clerestorey windows were often provided at high level above the corridor to light the rear of the classroom.

Deep plans

The emphasis on open plan arrangement of classrooms and practical areas in the 1960s and 70s, saw much deeper plan forms without corridors emerge. Clerestorey windows were replaced by roof lights at the rear of classbases usually mounted on the flat roofs, which inevitably covered such deep plans at this time.

Fenestration

The energy crisis of the 1970s saw windows reducing in size to control heat loss through poorly insulated glazing, and many roof lights were omitted for the same reason. The ratio of glazing to external wall area by the early 1980s in some Essex primary schools fell to as low as 15%, and the minimum daylight factor was all but abandoned, with extensive use of permanent artificial lighting to supplement daylight.

Computer modelling

Design teams in Essex with their environmental engineering expertise and access to computer modelling realised, however, that there was a balance to be struck in energy use between small windows which reduced heat loss and large

windows which increased natural daylight and reduced electricity bills for permanent artificial lighting. The amount of glazing gradually rose during the late 1980s until present levels, where average daylight factors are between 3 and 4% with very little use of supplementary artificial lighting. (See Illustration D78).

Artificial sky

Design teams realised, however, that the computer modelling techniques available at this time were rather limited and only reliable for simple regular shapes of classrooms with flat ceilings. It was decided, therefore, in the mid 1980s to invest in an Artificial Sky built jointly with Anglia Polytechnic in their Department of the Built Environment adjacent to County Hall.

This allowed design teams to build 1:20 scale models of their designs in cardboard with realistic glazing patterns and appropriate reflective surfaces in their interiors. The model could then be placed in the Artificial Sky with its illuminated ceiling and mirror walls which reproduced the lighting conditions of a standard British overcast sky. Light meters could be placed within the model at working plane height and actual measurements recorded of the amount of light reaching every part of the interior.

The other great advantage was that the quality of the day lighting could also be observed by the naked eye and recorded for future reference on camera. It was also possible to physically alter the model by increasing or decreasing the size of windows and roof lights and reproduce the effect of obstructions, external shading devices and different types of glazing (see illustration D80).

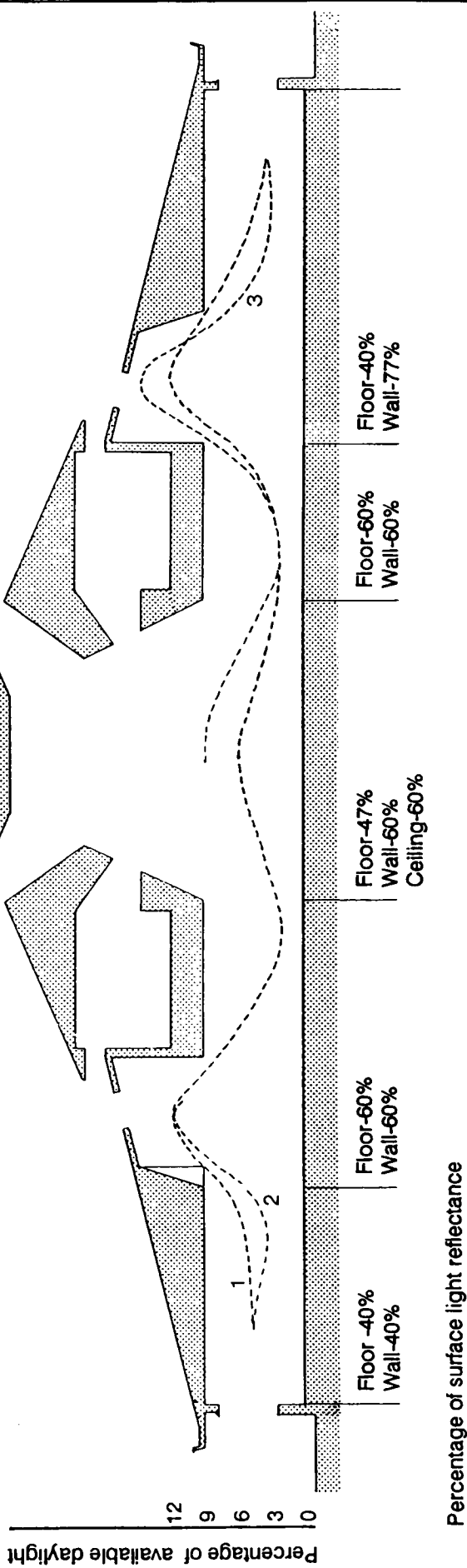
Correction factors

It was observed, however, that even with fairly sophisticated modelling techniques, some primary school designs were still rather underlit in places, despite predictions to the contrary. Research carried out by Anglia Polytechnic staff (Frame, I., 1993), who measured actual daylighting levels inside completed schools in use compared to actual external lighting levels, revealed that lighting levels were consistently below those predicted by computer and Artificial Sky modelling during the design period.

Test 1 Trusses canted back 500mm
Single glazed windows 0.89 L.I
Double glazed roof lights 0.72 L.I

Test 2 Square truss angle

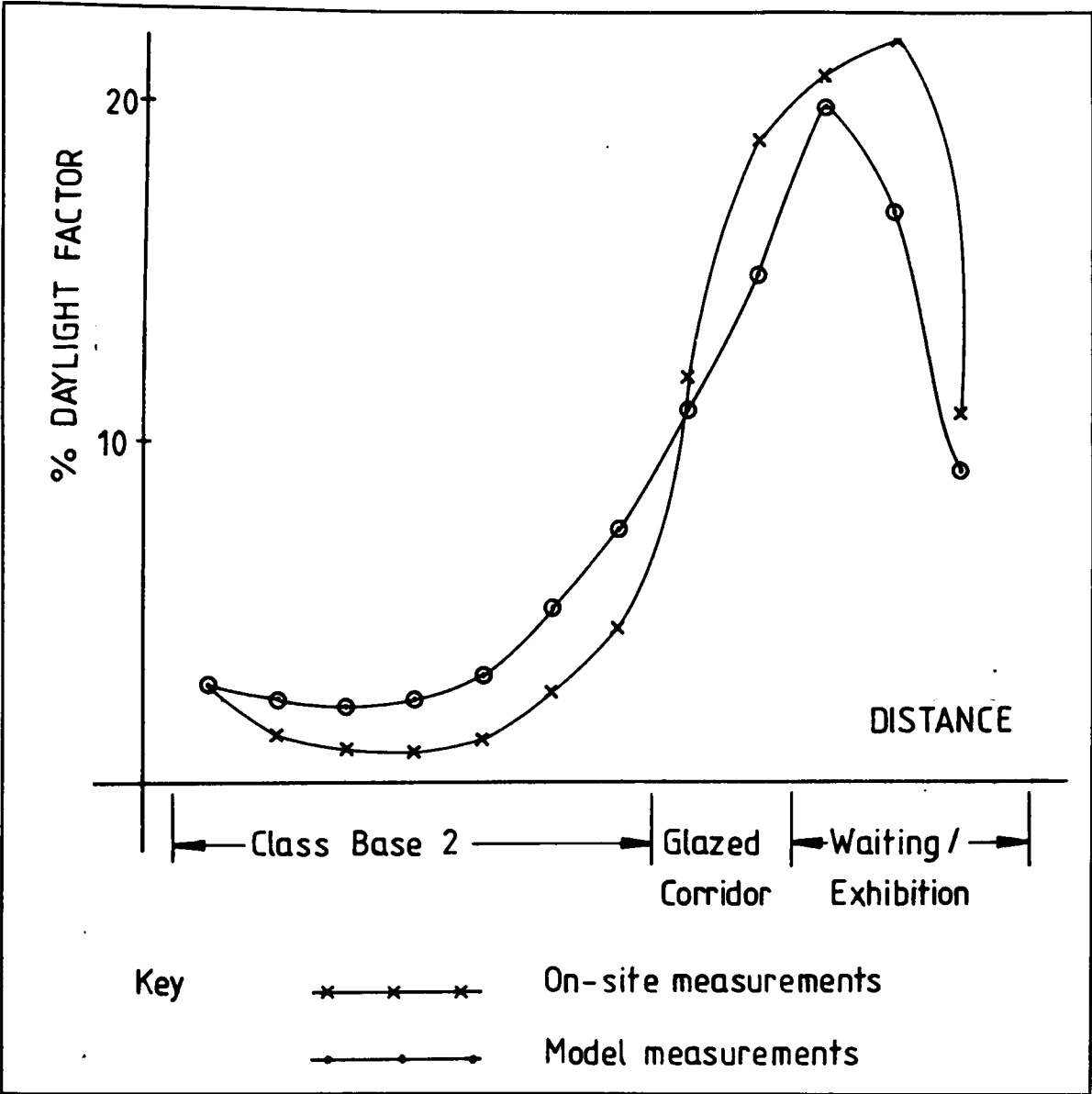
Test 3 Square truss angle single
glazed throughout
No allowance made for various
light reflectances



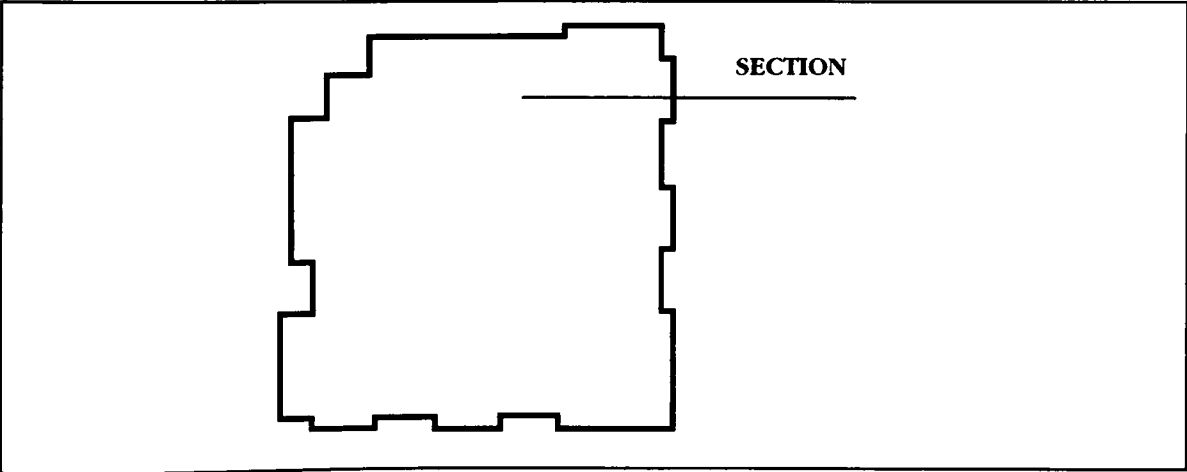
SECTION

**ILLUSTRATION D78 - NATURAL DAYLIGHT SCHEME
AT MAYLANDSEA PRIMARY SCHOOL**
showing good distribution of daylight by use of rooflights, splayed
ceilings and borrowed light.

Reproduced from Committee Brochure
(see Essex County Architects'
Department, 1988.)



GRAPH SECTION showing difference between predicted and actual percentage daylight factor.



PLAN showing position of graph section.

ILLUSTRATION D79 - DAYLIGHT RESEARCH AT ST PETERS SCHOOL, COGGESHALL.

Reproduced from Daylight Research Project Report (see Frame, I., 1993.)



**MODEL OF MANUDEN PRIMARY SCHOOL
HALL UNDER TEST IN ARTIFICIAL SKY**

Reproduced from Committee
Brochure (see Essex County
Property Services' Department,
1995.)
Original in Colour.

**ILLUSTRATION D80 - THE ESSEX COUNTY COUNCIL/ANGLIA
POLYTECHNIC ARTIFICIAL SKY IN ACTION.**

This is thought to relate to reductions in the actual reflective values of walls and ceilings, due to large areas of walls covered with displays of children's work and large areas of the ceiling obstructed by objects hanging from the roof.

The other factor appears to be a considerable reduction in transmission factors of external glazing due to the lack of window cleaning and build up of dirt. This is a particular problem with patent glazed roof lights which often have no safe access for cleaning.

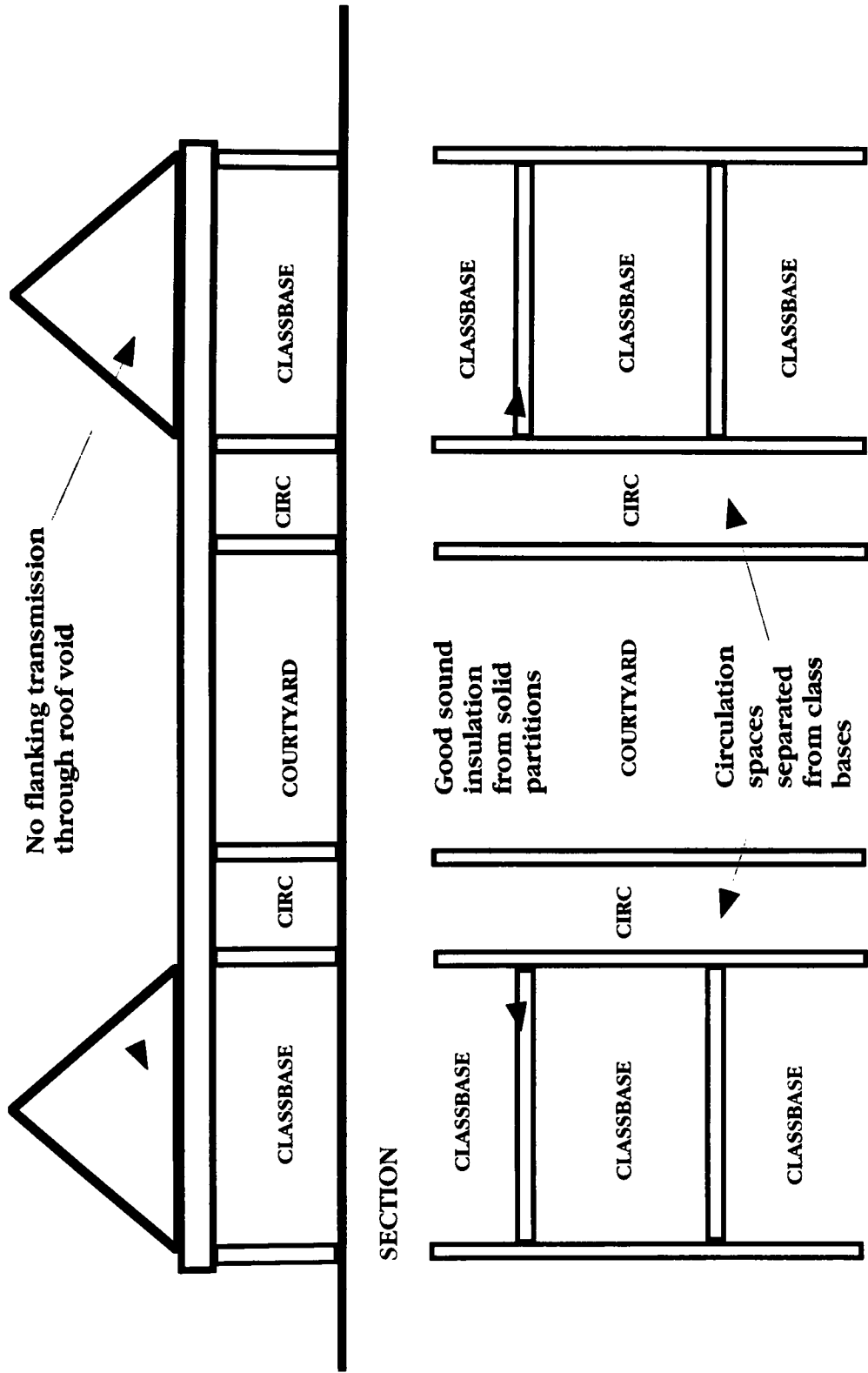
Areas of glazing and reflectance values have been increased in recent computer predictions and modelling to compensate for these factors (See illustration D79).

8.11 NOISE

Traditionally noise was not thought to be much of a problem in the primary schools of the 1950s and 60s, as most teaching and learning took place in individual classrooms, well insulated from each other and connected by dedicated circulation space. Any build up of noise within the individual classroom was dealt with by the class teacher through disciplinary procedures. As a result, partitions between classrooms were plastered heavyweight brick or blockwork, giving good sound insulation, and the surfaces of walls, floors and ceilings tended to be hardwearing with little thought given to their absorbent value (see illustration D81).

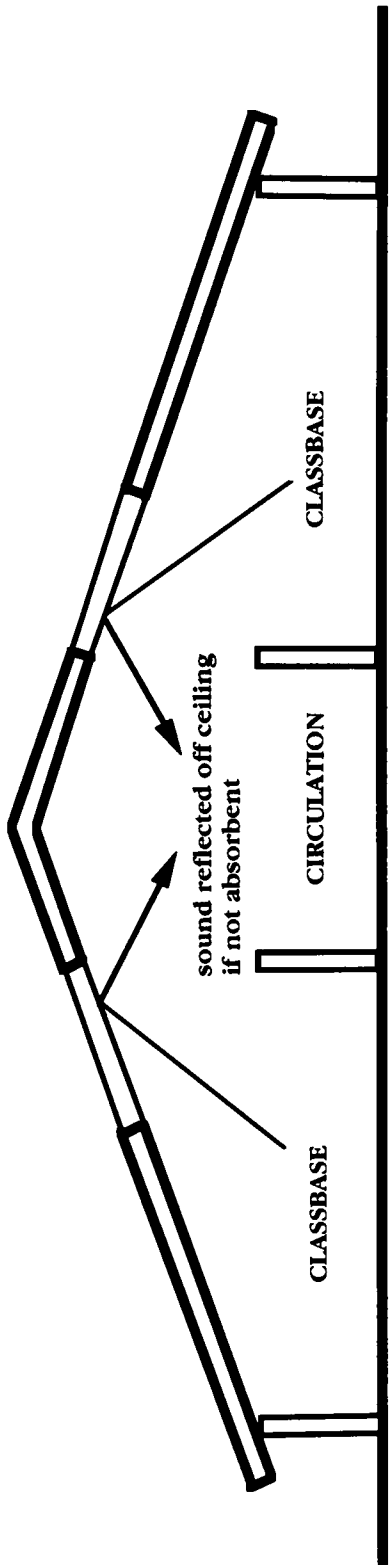
Open plan

Open plan layouts during the late 1960s and 1970s were common place in certain building types such as offices and schools to improve on space utilisation and flexibility. Much of the early research on the potential noise problems of such layouts centred around the German *Burolandschaft* (Landscaped office) with its simple low screens or indoor planting separating different groups or individuals. The intrusion of noise was controlled by the extensive use of highly efficient and expensive absorbent screens and ceilings an acceptance of a certain level of background noise which masked individual conversations.

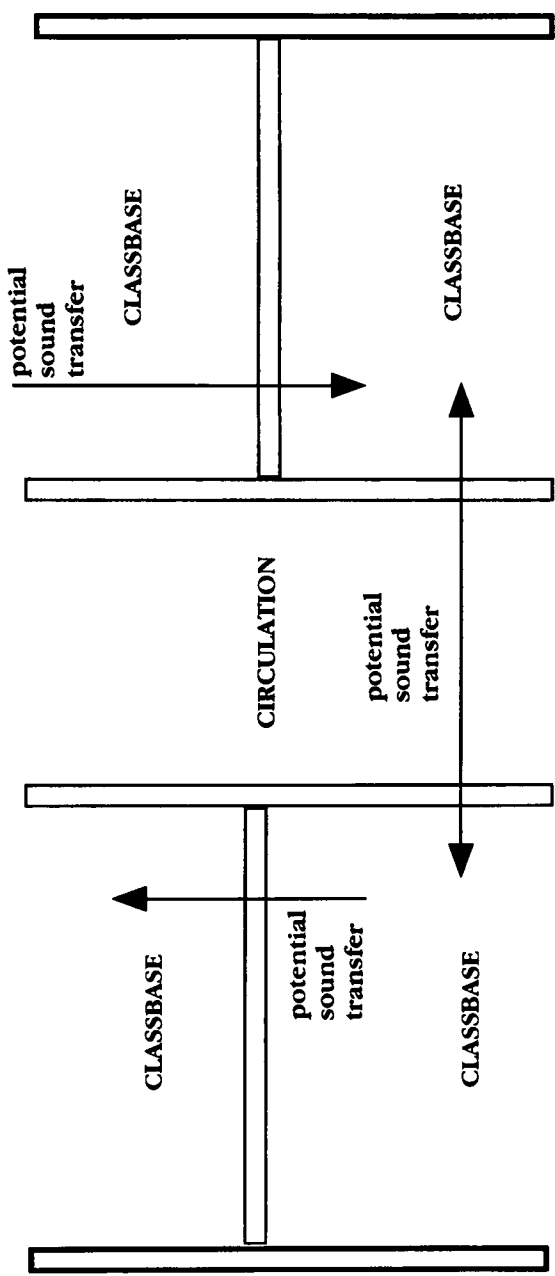


PLAN

ILLUSTRATION D81 - CELLULAR FLOOR PLAN WITH GOOD NATURAL SOUND INSULATION



SECTION



PLAN

ILLUSTRATION D82 - OPEN PLAN SCHOOL SHOWING POTENTIALLY POOR SOUND INSULATION PROPERTIES

As the open plan designs of the early 1970s developed in Essex primary schools, noise became much more of a problem due to the nature of classbase sub-division. The very early open plan MCB primary schools initially had no acoustic division between classbases, relying on curtains or storage furniture to give some visual privacy. Complaints from users about the intrusion of noise from one class to another soon forced a reappraisal of partitioning systems, and robust sealed acoustic partitions were provided round noisy activities such as audio/visual work. Solid blockwork walls were provided round permanent features such as toilet, kitchens and the admin suite. Partitions round more transitory activities were formed using free standing screens or furniture (see illustration D82).

Noise absorption

The problem of noise transfer was recognised in open plan MCB schools and attempts made to provide absorptive surfaces by the use of carpets on the floors, fissured board suspended or coffered ceilings and hessian covered pinboard on walls. These surfaces were not scientifically designed, however, and were relatively inefficient with only a limited effect on noise levels with teachers often forced to adopt a timetable where all classes made a noise or were quiet at the same time.

It would appear that with the demise of MCB with its modest built-in absorbent surfaces and the introduction of more traditional methods of construction, the build-up of noise levels has been completely overlooked, especially in schemes where hard plasterboard lined pitched ceilings are able to reflect noise from one part of the school to another.

Noise insulation

Faced with pressure from teachers to introduce more cellular plans designers started to group noisier activities such as cloakrooms, music, drama, watching TV and craftwork together and surround them with sound insulated partitions to reduce their impact on quieter activities in the classbase.

Designers have had to relearn the science behind sound insulation and the importance of density of partitions, sealing of joints and the avoidance of flanking transmission etc.

Specialist advice

Unlike other environmental disciplines the department has never had acoustic experts on the staff, the most notable exception being John Fulbeck who was an Assistant County Architect in the 1970s and 1980s, who took a particular interest in acoustics and was able to advise design teams on particular problems. Unfortunately, John retired in 1985 and we were without an expert until one of the mechanical engineers, Derek Gilson, took a specialist training course at the Colchester Institute of Further Education and is now able to advise on acoustics, with particular emphasis on noise from ventilation plant.

Unfortunately, design teams have viewed the involvement of such experts as an unnecessary intrusion and source of delay to their projects, and acoustics, rather like environmental engineering, has not really had the impact it should have on every day primary school design, with acoustic design restricted to development projects.

8.12 VENTILATION

The efficient ventilation of a primary school is a major constituent of the users satisfaction with their environment, with complaints during the summer if there is a lack of a cooling air movement and complaints in the winter if the school has a stuffy, smelly and foetid atmosphere with condensation on cold surfaces.

Natural

The ventilation of primary schools in the 1950s and 1960s was traditionally by natural means with opening windows on either side of the classroom to give cross ventilation. The high level opening clerestorey windows at the rear of classrooms were particularly effective during the summer as they operated partly on the stack effect created by the higher ceiling height next to the windows. Classrooms also had a mixture of large side or pivot hung opening vents at low level for use in the summer only and higher smaller top hung vents for trickle ventilation during the winter and inclement weather.

The deeper plan forms of schools in the 1970s and 1980s made natural ventilation difficult and courtyards were often introduced into the centre of the school to give opportunities for cross ventilation.

Sealed buildings

The preoccupation of design teams during the early 1970s with energy conservation led to greater concern about uncontrolled ventilation rates in Essex primary schools as this was seen to be a significant element of heat loss during the winter. As a result, several of the early MCB primary schools were not provided with opening lights but had glass, gasket glazed, direct into the openings of concrete external wall panels providing a sealed environment with mechanical ventilation.

Unfortunately, these schools were heated with inefficient gas fired warm air units often mounted on the roof which failed to deliver warmed fresh air to certain parts of the building due to the leaky ducting system, and users often complained of poor air quality and under-heating.

Low ventilation rates

Ventilation rates were also kept to a minimum with some schools cut to one or two air changes per hour to reduce heat loss.

The underheating of some areas and the stuffy atmosphere resulting from low ventilation rates led to a constant stream of complaints from teachers who did not like the warm air systems with their lack of control, and subsequent MCB schools were fitted with opening windows for natural ventilation and LPHW heating systems serving radiators or fan assisted convectors.

Controlled ventilation

The desire to control ventilation rates in primary schools during the winter also led to the designation of summer and winter doors. The main entrances to the school which were used by pupils, parents and teachers at the beginning and end of the day and during break-times to access coat stores and toilets, were all fitted with draught lobbies and were designated as winter doors. Other entrances and exits from classbases to outside teaching areas opened directly into the school without lobbies and these were restricted to summer use only.

Mechanical ventilation

It was appreciated that certain activities within the primary school produce obnoxious fumes or high levels of humidity which natural ventilation or warm air heating systems could not adequately ventilate. The following areas, therefore, usually had mechanical ventilation systems in the form of extract fans mounted on the flat roof :-

- Kitchens had hoods over cooking and washing-up equipment with multi-speed extract fans to vitiate foul air and steam. These systems have worked fairly well, but problems of cold balancing air in winter creating discomfort for staff and grease coated surfaces, has led to the adoption of more sophisticated and more expensive ventilation systems in kitchens with the introduction of tempered balancing air and easy clean filters.
- Toilet areas can cause ventilation problems in primary schools, particularly in boys toilets with their smelly urinals. This was largely overcome in the primary schools of the 1950s and 1960s by positioning toilets off circulation corridors and next to external walls, with the opportunity for plenty of opening windows and natural ventilation.

The adoption of the open plan form and siting of toilets in more central positions, often opening direct from a teaching space without any external wall, led to the introduction of extract fans with borrowed balancing air through doors and fanlights.

The return to more traditional forms of construction in the late 1980s early 1990s has seen the use of extract fans in toilets continue, even though many have opening windows to ensure a positive flow of foul air away from teaching spaces, particularly in the winter.

- Other specialist equipment such as kilns and duplicators have also been fitted with extract fans to vitiate foul air at source.

- The use of the Audio Visual room has also caused considerable ventilation problems, particularly when used by a class of young people watching a television programme. Many of the AVA rooms in the early MCB primary schools were located deep within the plan to give easy access to all classbases, and these had to be provided with mechanical extract to avoid overheating and provide sufficient fresh air. Even later plans with AVA rooms located on the perimeter with opening windows for natural ventilation had problems when dim-out or blackout blinds had to be lowered, obscuring the opening windows, and these also needed extract fans.

8.13 HEATING SYSTEMS

The other constituent of a happy primary school is an efficient, controllable heating system giving comfortable working conditions in all areas of the school, even on the coldest winter's day. Most primary schools have boilers located in a plant room feeding radiators fixed beneath external windows, but many other systems have been used in Essex schools over the last 25 years with varying degrees of success.

Low Pressure Hot Water and Radiators

Traditionally the heating system used throughout most Essex primary schools in the 1950s and 1960s was a low pressure hot water system (LPHW) fuelled by an oil or gas fired boiler serving radiators mounted under windows.

After a short flirtation with warm air, this system continued into the MCB schools of the 1980s and is still in use in most schools today. This system has proved to be reliable, controllable and the preferred choice of most teachers who feel they can control their local environment by adjusting the thermostatic valves on the radiators in their classrooms.

Warm air

Several of the earlier MCB primary schools built in the 1970s were fitted with gas fired warm air heating units mounted on the roof, blowing warmed air through the coffered ceiling troughs formed along the lines of steel roof beams and discharging into classrooms through grilles fixed in the minaboard tiles. Air was returned to the units through other grilles mounted in the ceiling and

mixed with fresh air from external inlets before being heated and returned through the ceiling ducts. Unfortunately, these coffers were not sealed and warm air leaked at all the joints so that very little air was delivered through grilles at the end of ventilation runs, giving cold spots in certain parts of the school, leading to constant complaints from users about comfort conditions.

Experiments were also being carried out at this time with the recycling of heat from extract ventilation air through the use of heat extractors or recuperators, as used at Ravenscroft and Roachvale Primary Schools. Unfortunately, monitoring has shown that although these systems had low energy consumption they were expensive to run as they were electrically powered.

Under floor heating

One or two development projects also used under floor heating with warm water from heat pumps or boilers flowing through plastic tubes buried beneath floor screeds on top of insulation panels. The under floor heating was difficult to control, however, as it responded very slowly to sudden changes in climate and is best used for the base load as at Ravenscroft Primary School, Clacton, with a warm air or radiator heating to top it up when required. It does fit very well with the use of condensation boilers, however, which are most efficient when operating with the low flow and return temperatures of such a system.

Fan assisted convectors

There was a period in the late 1970s and 80s when the use of fan assisted radiators was popular, particularly in halls and open plan classbases where the forced mixing of air avoided stratification and any risk of cool pockets of air away from radiators. Unfortunately, fan assisted convectors have a high maintenance requirement, with regular servicing of fans and cleaning of filters and they can become noisy with age. They have, as a result, tended to be phased out in recent years, apart from larger spaces such as halls which require forced air solutions.

Zoning and controls

The control of heating plant in Essex primary schools of the 1950s and 60s was rather basic, with boilers and pumps simply being switched on at the beginning and end of the day by means of a time clock and moderated during the day by

a thermostat mounted in the hall. All of the radiators were usually on one circuit which ran at a constant temperature throughout the day.

The early MCB primary schools started to address some of these problems by introducing more sophisticated control systems with electronic time clocks and external sensors, which could be programmed to take account of weather conditions and start boilers at an optimum time, often several hours before pupils and teachers arrived at school.

Pipework was also arranged into smaller circuits so that orientation could be taken into account, with radiators on southern elevations automatically turned down when the sun came out, and radiators on the north side continuing to heat colder spaces. The zoning of pipework could also make allowance for the increasing use of the hall for community events out of school hours and during holidays, by putting it together with toilets etc. on a separate circuit allowing the heating for the rest of the school to be turned off.

Building energy management systems

These controls have become even more sophisticated in recent years, and current schools are being fitted with computer controlled Building Energy Management Systems (BEMS) which allow all of a school's electrical and mechanical plant to be programmed and monitored from a central control point, usually in the Area Surveyor's Office. The monitoring of these systems has improved efficiency and saved large amounts of energy and money for the Authority and latterly LMS schools, but the schools are generally unhappy with their installation due to a lack of control by the users of the building, who do not like the remote nature of the control centre.

8.14 HOT AND COLD WATER SERVICES

Hot and cold water services in Essex primary schools have not changed significantly during the past 25 years, apart from specific issues including the amount of water stored, method of heating and storing hot water, water conservation and the limited use of solar heating.

Cold water storage

The amount of cold water stored in primary schools has increased dramatically over this period as a result of changes in the water companies bylaws, and storage tanks in roof spaces have become larger and heavier, increasing costs due to increased roof space and the larger structures needed to support them. The quality of storage tanks has also improved from open top, galvanised, tanks squeezed into roof spaces to properly engineered, sealed, and insulated fibreglass or plastic tanks mounted on tank safes, with ample access to maintain ball valves, etc.

The department also experimented with various types of large diameter plastic pipe cold water storage vessels in the earlier MCB primary schools, suspended between roof steels in an attempt to avoid expensive tank rooms on the roof. These proved unsuccessful, however, due to problems with reduced head and limited capacity.

Water conservation

The rising cost of water, particularly since privatisation of the supply companies, has also put greater emphasis on water conservation in primary schools with the installation of water saving devices on flushing mechanisms and use of spray and percussion taps in wash rooms.

Hot water storage

Traditionally primary schools of the 1950s and 60s stored hot water in a large calorifier housed in the boiler room, with pipework serving the various hot water supplies in kitchens and toilets (at this time very few classrooms were supplied with hot water). The increasing use of hot water in practical areas and concern about fuel costs and energy conservation has led to the discontinuation of this practice because of the huge distances between draw off points, wasting hot water which cools in uninsulated pipework.

It has been common practice during the past ten years, therefore, to see a much smaller calorifier in the boiler house serving the kitchen and toilet areas nearby, with the remaining water heating dispersed through the use of local electric immersion type water heaters serving groups of toilets and practical areas.

Solar panels

One or two experiments with roof mounted solar panels to heat hot water were carried out in the early 1980s at Briscoe Infants and Junior School, Pitsea and Castlevew Secondary School, Canvey Island. Unfortunately, the amount of sunshine in Essex particularly in the winter, the need for back-up heaters, and cost of installation did not make this system financially viable for most primary schools, with their short working day and long holidays and no further panels have been installed.

8.15 ARTIFICIAL LIGHTING

Artificial lighting is an important factor in the primary school environment as it not only supplements natural daylight to enable pupils and staff to carry out various activities, but also gives character to interior spaces by creating brightness and shadow on surfaces and emphasises colour and texture. It has changed considerably over the last 25 years as lighting technology has provided more efficient light sources such as fluorescent tubes and discharge lamps mounted in various types of glare free fittings.

Tungsten lighting

Artificial lighting in the Essex primary school of the 1950s was traditionally provided by tungsten pendants with glass or plastic shades. These fittings were domestic in character, but relatively inefficient being expensive to run and producing poor levels of illumination at the working plane.

Fluorescent fittings

The 1960s saw the introduction of the fluorescent tube into Essex primary schools and they were the first choice of fitting for the MCB schools of the 1970s, with continuous runs of fittings between the coffered ceiling giving good, glare free, even levels of illumination.

Tungsten spots

It was realised, however, that exclusive use of fluorescent fittings in the primary school gave a rather flat institutional feel to a building which needed to be as homely as possible. Designers, therefore, included a variety of tungsten fittings

such as down-lighters and spotlights to create sparkle and illuminate features such as display and marker boards which gave greater character to lighting schemes. Unfortunately, many of these fittings which were often fixed to lighting track for flexibility, have now been removed by the schools or their bulbs not replaced when they reached the end of their life and many of these fittings are now not used at all.

Uplighters

Several of the traditional open pitched roof schools of the mid 1980s such as Barnes Farm Junior school, Chelmsford attempted to get away from the monotony of the fluorescent tube fitting and uplighters, by using low energy discharge lamps, which were installed to "bounce" light off the underside of the exposed pitched roof. Unfortunately, many of the discharge lamps produce a colour rendering in the yellow/orange part of the spectrum and these schools have a rather gloomy appearance, even though illumination levels are acceptable.

Controls

The energy conservation movement of the 1970s also led to considerable experimentation with lighting controls in an attempt to ensure that fittings were not left on when not needed. These included :-

- Lighting connected to movement detectors so that they switch off when no one is in the room.
- Lighting automatically switched off by a pulse sent through the wiring after breaks and after lunch, with teachers switching it back on if needed.
- Lighting controlled in banks away from windows allowing teachers to switch off lights nearest the windows when natural daylight is sufficient.

Generally teachers have not liked the first two of these systems as they do not feel in control of their own environment and as these systems involve considerable extra cost, very few have been installed.

Drama lighting

Most halls in primary schools have some form of drama lighting with spotlight and floods mounted on a boom or track for use in informal drama or the annual Christmas production. These systems have become increasingly sophisticated with miniaturised remote controls avoiding the large wall mounted switches and patch panels of the past.

Several head teachers have pointed out, however, that some method of adjusting drama lighting from the floor is needed to avoid the need for mounting tall step ladders which is discouraged in schools.

Computer lighting

The increased use of computers in schools has also led to a greater use of specialised fluorescent fittings with directional diffusers which do not create distracting reflections on V.D.U. screens. These are now fitted in all office areas and at least one area of the classbase, although increased use of computers would suggest even greater numbers are justified.

Lighting design

Unfortunately, apart from a few notable exceptions, artificial lighting was very much an afterthought in the design process during the 1970s and 80s with fittings added to completed design concepts. Several of the department's electrical engineers have now developed a special interest in lighting design and it is encouraging to see them involved in the initial conception of schemes to ensure that artificial lighting is fully integrated with other elements of the design such as interior design, natural daylighting, structure and position of ventilation equipment, etc.

8.15 ELECTRICAL POWER

The past twenty years has seen the increasing use of electrical power in Essex primary schools, due to the importation of a range of electrical and electronic equipment. In the early 1970s it was not uncommon for the average primary school to have only one television and kiln, a radio, a duplicator, one overhead slide projector and perhaps an electric typewriter. Today's primary school has several televisions with video recorders, CD player and tape recorder, several

personal computers and printers on trolleys, word processors in the office, and a computer for the accounts, photocopier, etc.

This has led to a dramatic increase in the number of socket outlets on the ring mains around the school, with each classbase having at least 3 double socket outlets, plus separate circuits for equipment with heavier loadings in the kitchen and the kiln.

Business equipment

The office has also been completely transformed from a paper to an electronic based operation, with school newsletters produced using desktop publishing programmes, and school accounts and pupils records kept on specialist databases and spreadsheets.

Computer networks

The increasing use of personal computers with a range of basic teaching, individual learning, and project based programmes has led to many schools now installing network cabling linking all the classbases, together with a central computer room where a file server can be used to provide a range of programmes and printers to all pupils and staff.

The increased use of computers networked together has led to the use of trunking in many spaces so that equipment can be repositioned and supplemented without major rewiring and consequent disruption.

Audio visual equipment

Audio visual equipment in the 1970s primary school would have typically consisted of a television, film projector and overhead projector, all stored and used in a specialist room with blackout facilities with whole classes and smaller groups visiting to view. Current equipment rarely includes a film projector, but will include one or two televisions with video recorders on trolleys and overhead projectors which can be wheeled into classbases or the amenity room and dim-out blinds lowered to avoid a troublesome sun.

Specialist arts and crafts equipment

Most primary schools in the 1970s were provided with an arts and craft area fitted with an electric kiln with a significant loading to facilitate the production of simple fired pottery, and a cooker for basic cookery lessons. Today's primary schools use self-setting ceramic materials to avoid the time consuming firing process and kilns are frequently unused. They can also have basic craft areas for older pupils, however, who are able to use domestic power tools such as drills and sanders under supervision, and more socket outlets are required.

8.17 COMMUNICATIONS

Communications equipment in the primary school has changed dramatically over the past 25 years from the single telephone in the office to a range of telecommunication equipment throughout the school.

Telephone

Twenty years ago a typical Essex primary school would have had one telephone in the Secretary's Office with an extension to the Head Teacher's room. Today's school has several telephone lines with modems for computer communications to:-

- County Hall to run the school's finances.
- To a security firm to alert them of intruders out of school hours.
- To the area building surveyor to monitor the Building Energy Management System.

Facsimile (FAX)

Most primary schools now have a combined answering/FAX machine to allow them to order materials and equipment quickly direct from suppliers, and receive urgent messages from external agencies about security alerts, budget problems and meetings, even out of school hours.

Mobile telephones

Several of the larger primary schools with an extensive programme of school visits to the swimming pool, nature reserve or local factory, now have a mobile telephone so that the teacher in charge can contact the school or emergency services without having to leave the pupils unattended if there is an incident of any kind.

8.18 FIRE AND SECURITY

The Essex primary school of the early 1970s was a relatively relaxed institution with little concern about security issues, apart from the more urban areas along the Thames corridor, the London fringes and some of the new London overspill estates.

Unfortunately, the social problems of these areas involving burglary, vandalism and arson of primary school property have spread and the majority of Essex primary schools now have to give considerable thought to these security threats.

Day time intruders

The alarming number of incidents over recent years, including the murder of Philip Lawrence and the horrific events at Dunblane, with intruders entering the building during school time to snatch children or attack pupils and teachers has led to a dramatic increase in security, and most Essex primary schools now have a controlled entry to the school where visitors are logged in and out of the building and issued with visitors badges to ensure no unauthorised person is allowed to wander around the school.

The recent report by the DFEE working group on school security outlines the dilemma faced by schools and their local communities, however, when it states "...on the one hand schools want to be open, welcoming places for pupils, parents and the local community. On the other hand staff and pupils must be able to work and learn in a safe and secure environment" (DFEE, 1996).

This report also contains six recommendations which will have a direct impact on the design of new and existing primary schools including publication of guidance to Headteachers and Governors on :-

- The use of intruder alarms, CCTV and security lighting.
- Control of access to schools.
- Rerouting of rights of way.
- Funding of CCTV installations.

It is still too early to be clear about the long term effect of these recommendations, but primary schools are bound to become less open and more introvert as a result of public concern about the safety of children.

Fire

Fortunately fires in occupied schools are rare, but all schools have been designed to strict design codes over the last 25 years to provide protected means of escape from the building in case of fire, with fire screens and self-closing doors to prevent flames and smoke from entering these circulation routes. Most schools are single storey with many exits direct to the outside and the risk to life from fire is thought to be minimal.

The majority of fires in schools are the result of arson or vandalism out of school hours and the main effect is to damage property, putting the building out of use while it is redecorated, repaired or in extreme cases rebuilt.

Vandalism

Statistics show that the biggest threat to a primary school is from intruders who break into the school out of hours and daub walls, smash windows, doors and equipment for their own amusement, putting classrooms out of use for days afterwards while the damage is repaired (DES, 1987).

Theft

Many schools also suffer from intruders who break in out of school hours to steal books, equipment, computers and other electrical equipment, depriving pupils of their use until they can be replaced by a claim on the insurance.



Insurance

Twenty five years ago the insurance risk in most Essex primary schools was low with modest premiums paid each year. Claims have been steadily rising every year from vandalism, arson, and theft, and insurers are now playing an increasing role in school design in an attempt to reduce the risks and avoid unacceptably high premiums.

They are now suggesting that smoke detectors should be fitted in schools with a history of arson to give early warning of a fire to prevent damage to property, and an intruder alarm and security lighting to discourage theft and vandalism.

Intruder alarms

Very few Essex primary schools were fitted with intruder alarms in the early 1970s, but this was found to be necessary in the socially deprived areas of the County by the end of the decade and they are now common in most areas. Contacts are not fitted to external doors as intruders can use any external door or window to gain entry, but they are fitted to internal doors, through which intruders must pass, together with movement detectors in vulnerable areas such as the office or amenity room where valuable equipment is stored.

The detectors are either connected to an alarm bell and flashing light to alert neighbours or scare the intruders away, or they are connected to a security firm by telephone line to give a silent alarm with a possible arrest by the police alerted by the security firm.

Security alert pagers

Some primary schools in Essex are now connected to a sophisticated telephone paging system which is able to warn them of incidents at other schools instantaneously from a central station so that they can take evasive action.

External Lighting

Most primary schools built 25 years ago had external lighting points at the main entrances to allow visitors to leave the building safely at night and for the caretaker to lock up. Many schools today have extensive external lighting

schemes connected to time clocks or movement detectors which illuminate the entire facade at night to deter intruders.

Close Circuit Television (CCTV)

Some primary schools with a history of intruders have also installed close circuit television cameras which scan the external spaces out of school hours, and record events on a video recorder for use by staff and the police investigating incidents. The presence of cameras also deters intruders from approaching the building.

Fire alarms

Simple fire alarm systems with electric bells and break glass call points at final exit points have been provided in Essex primary schools for many years to ensure that pupils and staff are warned of a fire in good time to allow them to evacuate the building safely. The bell system is also used in some schools to indicate the start and end of a teaching period or break.

Some schools also have smoke detectors fitted to the fire alarm system to alert the Fire Brigade by telephone line out of school hours.

Defensive planning

A great deal of advice is available from the police on how to encourage the local community to keep a watchful eye for intruders out of school hours, and how to design new schools to deter intruders, including :-

- Design for maximum surveillance.
- Defining the site boundary and appropriate boundary treatment.
- Avoiding landscaping which obscures the view of the building and gives an easy access to the roof.
- Siting of the car park and pedestrian routes to get natural surveillance from the building.
- Vandal resistant external lighting.

- Position and height of outbuildings to avoid obscuring the view of the building and give easy access to the roof.
- Obvious external alarm boxes.

Many of these suggestions fit well with the overall educational brief, but others such as avoiding landscaping near the building, and the position of walls and outbuildings can conflict with the need to give shelter and enclosure to outside teaching areas.

Building design considerations include:-

- Avoiding recessed sections of the building which have no natural surveillance.
- Appropriate type, style and material for external doors in positions for natural surveillance.
- Avoid louvered windows and external glazing beads and control size, type of frame opening and locking devices on all windows.
- Consider alternative glazing materials such as laminated or polycarbonate in unsupervised areas.
- Design roof to avoid security risk with steep pitch high eaves and secure roof lights.
- Avoid protruding service or rainwater pipes which can be used as an aid to climbing.
- Protect service connections such as gas, telephone, water and electricity.
- Maximum security of vulnerable areas such as offices, secure stores, stock rooms etc., which could be the target for burglary.

Again clearly, although desirable from a security point of view, some of these suggestions such as the avoidance of recesses and protruding features could produce an intimidating, prison-like character to the building if not handled

with sensitivity, and a balance must be struck between security, human scale, and the every day operation of the building.

8.19 CONCLUSIONS

There is evidence that the environment of Essex primary schools has undergone considerable experimentation during the last 25 years in an attempt to reduce energy use, to create greater comfort conditions, and provide flexible, efficient building services. Some of this experimentation has led to acknowledged improvements to the schools' environment, whereas others have been less successful, but much has been learned which can be applied to future primary school design including :-

- Much of this development work was driven by certain personalities within the department in both the architectural and engineering professions, often working together on projects, but also disagreeing on priorities and policy and sometimes creating unhelpful tensions. It is important that personality clashes are not allowed to obstruct such creative effort in future, with a clear departmental policy on environmental design and personal drive channelled into team work aimed at improving the performance of primary schools.
- Some of the development work was also driven by a desire by certain personalities to design in a holistic fashion where members of the design team worked together as a multi-disciplinary team from the very outset, fashioning the internal environment of the school from first principles through to detailed considerations. Unfortunately, this multi-disciplinary zeal was not shared by all professions in the department and the greater proportion of primary schools were still designed in the traditional fashion, with environmental problems often needing to be engineered out at the detailed design stage.

Recent Government research into the problems within the construction industry such as the Latham Report (Latham, Sir M., 1994) have demonstrated the value of reducing conflict within the industry and encouraging such team work, and greater effort is needed to get the multi-disciplinary message across to primary school design teams.

- The oil crisis of the mid 1970s created an undue emphasis on energy conservation in Essex, often at the expense of other design factors and although it brought about certain improvements to the school environment such as greater levels of insulation, better sealing of buildings and less responsive heavier weight structures, it also created problems such as lower levels of daylight from smaller windows and fewer roof lights, and poor heating and ventilation from warm air heating systems in sealed buildings. It is important that future initiatives of this kind are not allowed to dominate the design process with project teams considering all options and maintaining a balance between the various design pressures.
- The appreciation that energy conservation is only part of the much larger issue of pressure on the Earth's ecological system has subtly changed the emphasis of environmental design in primary schools from reducing the County Council's fuel bills to questions of global warming and husbanding the Earth's precious resources. This greater understanding of and emphasis on some of the wider green issues inevitably involves considerations of Western societies life-style in general and the inevitable conclusion that we must avoid too much reliance on fossil fuels and become more self-sufficient. This will involve a reappraisal of where primary schools are located, how pupils, parents and staff travel to them and possibly a restriction of admissions to local children. On a purely practical level, it will also dictate what our schools are made of and how their internal environment is controlled.
- The belief in the mid 1970s that most fossil fuels would run out by the end of the century encouraged the department's development team to experiment with the more efficient use of electricity, using new technology such as heat pumps, etc. Although these experiments improved our knowledge of such technology, the heating systems were plagued with operating and control problems and are now acknowledged to have been unsuccessful, often leaving a school with unresolved environmental problems. The future use of experimental technology should accept the inherent risks of using untried systems and provide a budget to rectify residual problems.

- The development of solar passive primary schools has been more successful, especially the use of solar heated secondary space such as covered courtyards, atria and streets which have become an indispensable addition to the teaching environment. Unfortunately, not all of these spaces had comfortable environments, with considerable overheating in summer and under heating in winter. The conservatory space was particularly problematic in this respect and has not been repeated in recent years. Future secondary space should have an acceptable environment throughout the school year to ensure it can be fully utilised, even if this means it has to be heated in the winter.
- The attempt to control the internal environment by the most efficacious orientation of schools and shielding of its facades from cooling winds has had an unexpected bonus, where local micro-climates adjacent to teaching spaces have been created by screen mounding and planting and should be encouraged.
- Generally the various attempts at collecting the beneficial heat from the sun via thermo-siphoning panels, greenhouses and roof mounted solar panels heating water, has been less successful, with energy savings not covering the cost of their installation. Future use of such technology looks unlikely unless the cost of the panels is reduced and automatic controls easily used by occupants can be provided cheaply.
- The introduction of a greater mass into Essex primary schools through the use of traditional heavyweight external walls and partitions has made them less susceptible to violent swings in temperature, and with careful programming of heating times made good use of the fly wheel effect of heat stored by the structure and released when the heating is off reducing energy costs. Recent suggestions that the cost of primary school building could be reduced through the use of lightweight timber framed systems would suggest that this lesson is in danger of being ignored.
- Enormous changes in daylighting of Essex primary schools have taken place during the past twenty five years varying from a period when the lightweight schools of the 1960s were overglazed, but light and airy, to the dingy, underglazed heavyweight schools of the 1980s with their small areas of glazing, poor daylighting and almost permanent artificial lighting. The schools of the last decade have achieved a better balance between

insulation and illumination, sometimes by using sophisticated prediction techniques with daylight factors good enough in most schools for artificial lighting to be restricted to the dark winter mornings and evenings. The greater use of natural daylight without increasing energy consumption should be encouraged in future primary school design and the use of computer prediction techniques and accurate modelling should ensure it is evenly distributed.

- Unfortunately, as primary school design moved from cellular plan forms to open plan forms design teams underestimated the potential for noise problems and did not use scientifically based prediction techniques during the design process. As a consequence partitioning systems proved to be too lightweight and ceiling, wall and floor surfaces not sufficiently absorbent. This was a particular problem with the traditionally constructed schools of the late 1980s with their large open pitched roofs which often reflected noise off their hard ceilings into adjoining classbases.

The situation has gradually improved in the last few years, but design teams still need to pay greater regard to acoustics using similar prediction techniques to those used for thermal modelling to ensure noise reduction of partitions, and absorption levels of internal surfaces produce an acceptable teaching environment.

- The constant increase in insulation values for the external envelope of most primary schools over the last 25 years has produced a situation where heat loss from the building fabric is now minimal and it is difficult to justify the cost of greater insulation levels. A greater problem is the tendency for such well insulated structures to over heat in summer conditions at certain times of the day. It will be necessary, therefore, to introduce some method of cooling such buildings down to at least ambient external temperature without resorting to air conditioning.
- Computer generated prediction techniques based on sound principles of environmental science have been available for use by Essex primary school design teams at the strategic decision stage since the early 1980s, but their use appears to have spread no further than the various development projects with most designers preferring to use their own rule of thumb judgements and calculations. This has resulted in some primary schools having a unexpectantly poor environmental performance when occupied,

heavily reliant on engineering plant to maintain comfort conditions. It is important, therefore, that future designs involve a proper environmental analysis based on science at an early stage, as a matter of course, to help the design team understand the relationships between different factors and predict the effect of later design changes.

- Generally teachers and children did not like the sealed buildings of the 1970s with their unopenable windows and warm air heating and ventilation systems, preferring the local control affected by the opening window and fresh air. Clearly opening windows and natural ventilation should be used in future primary schools, but teaching staff need to be trained to avoid over ventilation and undue heat loss. The funding of heating bills direct from the school budget and the possibility of spending savings on teaching materials should, hopefully, encourage a more responsible attitude.
- Users have also clearly preferred the simple but efficient low pressure hot water heating systems feeding radiators with thermostatic radiator valves which they can adjust in their own teaching spaces, to the centrally controlled warm air or under floor heating systems. Similarly, users have not liked the energy efficient Building Energy Management Systems linked to computers at the Area Building Surveyors' Office, preferring to have local controls which they can override if necessary. The message for the future appears to be "keep it simple and keep it local for satisfied users".
- Central controls of light fittings have helped save energy, but users have again not liked the loss of localised control in their teaching environment and future energy saving devices must give some degree of local control.
- There has been a dramatic increase in the amount and type of electrical equipment in primary schools during the past 25 years with the importation of audio/visual aids and computers into every teaching space. This has been matched by a corresponding increase in the use of electric security equipment in schools in every part of Essex, which is in itself a sad reflection of the spread of vandalism and violence within our society. The growth in electric and electronic equipment in schools appears as though it will continue and future schools will need increasingly sophisticated and extensive electrical, telecommunication and data transmission circuits if they are not to fall behind current technology.

- Security is becoming a significant aspect of design within primary schools, but many security experts, including the police, often see the solution to security dangers in simplistic terms and we risk turning our schools into fortresses if a balance between the many different design pressures is not maintained.
- It is clear from discussions with the users of Essex primary schools that communications between design teams and the occupiers of new schools over the past 25 years has been poor and this has subverted many of the intentions behind the original design. Clearly a discussion with teaching staff would have revealed that a curtain between teaching bases would not provide sufficient aural privacy at the first MCB primary school. A similar discussion would also have revealed that teachers have neither the time or inclination to open and close vents on thermal siphoning panels or appreciate the importance of switching off artificial lighting when natural light conditions allow. The consequences of reduced levels of air movement could also have been explained to teaching staff avoiding later complaints of a stuffy atmosphere and potential spread of diseases. Fortunately schools are more forthright since the adoption of LMS and now insist that they are involved in such discussions, but it apparently needs a complete mind set amongst certain design teams to explain their design to and maintain communications with the users throughout the entire design and construction process.

It is fair to say, in conclusion, that most primary school users feel that a safe, comfortable, controllable, internal environment is one of the most important constituents of the successful teaching environment, second only to the need for plenty of space. A study of 25 years of Essex primary schools reveals, sadly, that this objective has not always been at the top of every design team's list of priorities, but it must be given greater emphasis in future school design.

